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Website E-Commerce Toko Baros Elektronik Cimahi

Tiur Gantini,ST dan Deny Kurniawan

Jurusan D3 Teknologi Informasi

Fakultas Teknologi Informasi Universitas Kristen Maranatha

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Abstract

Toko Baros Elektronik Cimahi, located at Jl. Baros No. 32 Cimahi that sell many kind of electric equipment, like lamp, cable, and also sell electronic equipment, like transistor, resistor, etc. In running its administration, Toko Baros Elektronik still uses books to store data, making reports and does not have promotion tool yet. And since Toko Baros Elektronik Cimahi has expanded its business with an increasing number of selling equipment and promotion activities, writers provide a solution to convert manual operation selling to a web based computer application system by website e-Commerce. The new application is design to be simple, user-friendly, and web-based. It is intended mainly to making online selling, where customers can order and buy equipment without must come to the shop in anywhere and anytime, also change the order equipment by them self and know the total order by shopping cart. Not only that, this website e-Commerce system will publicize the up-to-date information about prices equipment with the picture, registration online to interested customers for purchasing process and improve administrative works where the shop manager can easily add, delete, view, edit, also generate daily, monthly, and yearly selling reports to know the profit. Therefore, this new website e-Commerce application will prepare Toko Baros Elektronik Cimahi to compete in this globalization era e-Commerce.

Keywords: Website, E-Commerce, online

1. Pendahuluan

Sekarang ini banyak dibuat website penjualan secara online, sehingga mempermudah konsumen dalam membeli barang yang dikehendakinya. Selain itu pula, fungsi dari website penjualan adalah sebagai media promosi suatu badan perusahaan tertentu yang secara tidak langsung akan mempengaruhi dari penjualan barang itu sendiri.

Tujuan dari pembuatan website ini adalah membantu konsumen dalam memilih barang apa saja yang dapat dibeli di Toko Baros Elektronik Cimahi tersebut. Dengan dibangun sistem perhitungan laba penjualan, sistem dapat mempermudah bagi pengelola untuk mengetahui transaksi apa saja yang sudah terjadi, baik yang telah disetujui maupun yang belum disetujui. Dalam website ini, diberikan pula sistem laporan penjualan dan laporan laba penjualan. Dimana dalam laporan penjualan, pengelola dapat melihat barang apa saja yang

telah laku terjual yang dapat dilihat baik berdasarkan laporan perhari, perbulan maupun pertahun. Dalam laporan laba penjualan, pengelola dapat melihat laba penjualan baik secara perhari, perbulan maupun pertahun.

2. Metoda

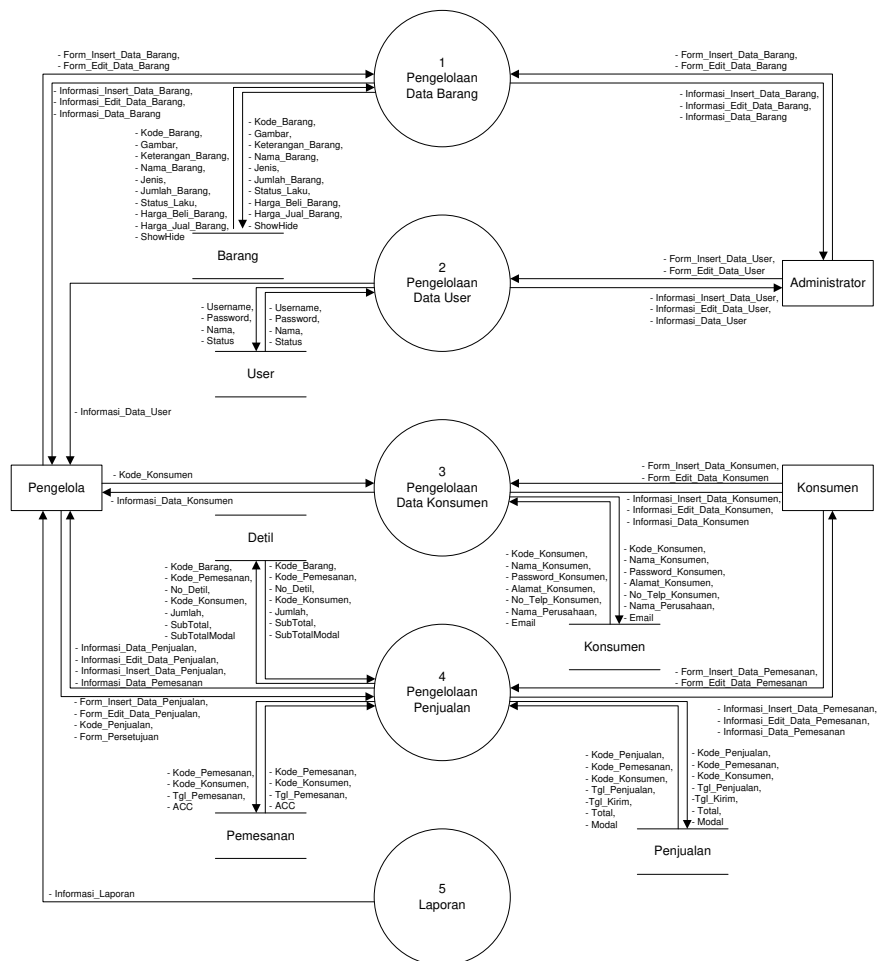
Website berfungsi untuk sistem penjualan secara online bagi Toko Baros Elektronik Cimahi. Konsumen dapat mendaftarkan diri sebagai member. Jika konsumen telah menjadi member, konsumen dapat melihat barang apa saja yang ditawarkan oleh pihak Toko Baros Elektronik Cimahi. Konsumen dapat memesan dan membeli barang yang ditawarkan. Setelah konsumen cukup untuk memesan, konsumen dapat mengakhirinya dengan menyetujui pembelian barang, kemudian sistem secara otomatis akan memberikan informasi pembelanjaan. Fitur-fitur yang terdapat dalam website ini yaitu:

1. Pengelolaan Data Barang
Fitur pengolahan data barang, dimana administrasi dan pengelola dapat melihat, menambah, dan mengubah baik dari jumlah barang yang tersedia ataupun data barang yang tersedia.
2. Pengelolaan Data User
Dalam website ini, terdapat 2 jenis user, yaitu Konsumen dan Administrator. Pada data konsumen, diisi langsung oleh konsumen pada saat pendaftaran. Pada Administrator, dikelompokkan kembali menjadi 2 jenis, yaitu Administrasi dan Pengelola. Pendaftaran Administrasi dan Pengelola dilakukan oleh Administrasi yang kemudian akan disampaikan username dan password kepada user yang bersangkutan.
3. Pengelolaan Data Konsumen
Fitur ini adalah untuk mendata konsumen Toko Baros Elektronik Cimahi. Selain itu, jika konsumen belum pernah melakukan pendaftaran, konsumen tidak dapat melihat barang apa saja yang ditawarkan di website ini, dan tidak dapat melakukan pemesanan barang.
4. Pengelolaan Penjualan
Dalam fitur ini, konsumen dapat melihat dan memesan barang yang diinginkan. Konsumen dapat pula melakukan pencarian barang dengan cara mengetik kata kunci yang nantinya akan ditelusuri berdasarkan nama barang. Barang yang dipesan, akan ditampung dalam keranjang belanja yang secara otomatis akan menampilkan jumlah harga barang yang dipesan. Setelah selesai, sistem akan menampilkan informasi biaya yang harus dibayarkan serta nomor rekening tujuan.

5. Laporan

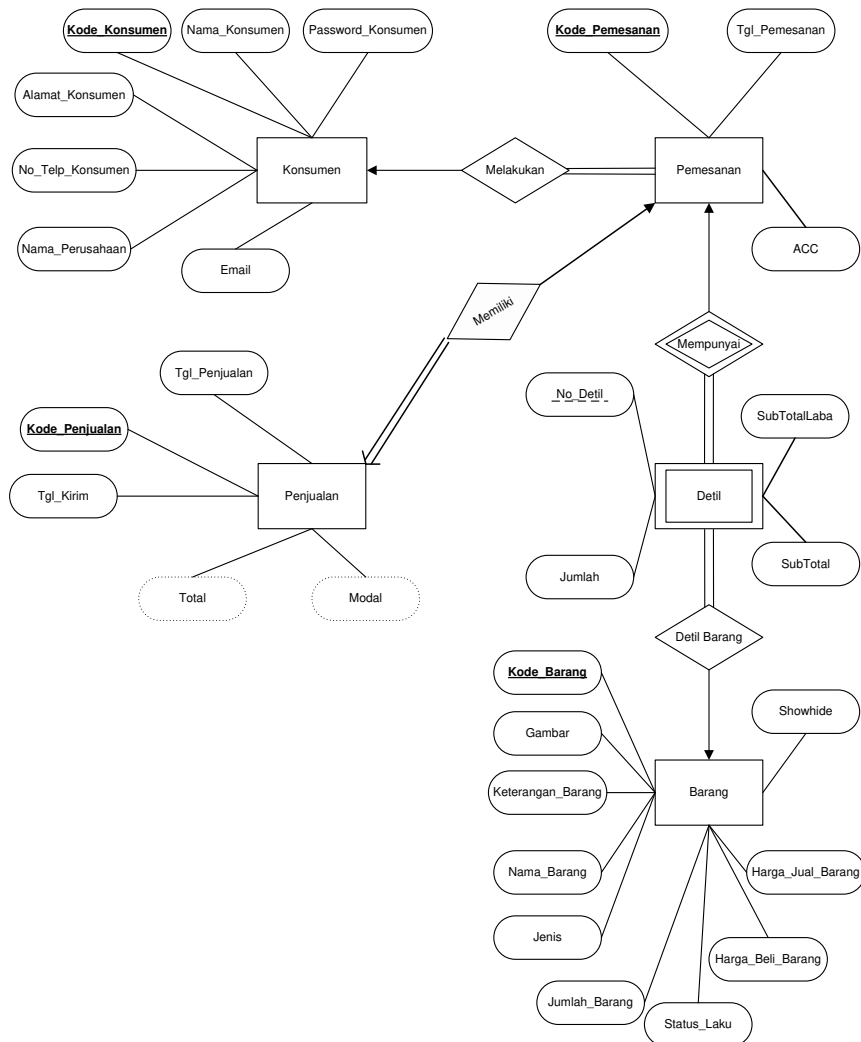
Fitur laporan berisikan laporan penjualan barang dan laporan laba penjualan, dimana di dalam laporan penjualan barang menjelaskan apa saja yang terjual dan oleh siapa barang tersebut dibeli beserta jumlah yang harus dibayarkan oleh konsumen baik secara perhari, perbulan maupun pertahun. Fitur ini untuk mempermudah pengelola dalam melihat transaksi yang terjadi dalam website ini. Sedangkan dalam fitur laporan laba penjualan berisikan laporan keuntungan dari barang yang sudah terjual kepada konsumen. Pada fitur ini, hampir sama dengan fitur laporan penjualan, tetapi ditampilkan hasil laba penjualan barang tersebut. Fitur ini bertujuan untuk mempermudah pengelola dalam melihat keuntungan yang diperoleh dalam transaksi penjualan.

Data Flow Diagram yang kelima fitur-fitur yang telah dijelaskan sebelumnya akan digambarkan sebagai berikut:



Gambar 1 Data Flow Diagram Website

Entity Relationship Diagram ini menggambarkan relasi dalam sistem basis data yang digunakan dalam website.



Gambar 2 Entity Relational Diagram Website

3. Pembahasan

Website ini dibangun dengan tujuan agar lebih mempromosikan Toko Baros Elektronik Cimahi serta membuat penjualan secara online, sehingga dapat dilakukan dimana saja dan kapan saja serta memberikan fitur laporan penjualan di dalamnya. Pada pembahasan ini akan ditampilkan beberapa tampilan yang ada di dalam website Toko Baros Elektronik Cimahi.

Berikut ini adalah tampilan awal, dimana di halaman awal terdapat ucapan selamat datang sebagai salam pembuka pada saat mengakses Website Toko Baros Elektronik Cimahi, beserta beberapa logo produk yang tersedia. Pada

halaman ini juga terdapat pilihan menu, yaitu Home, Tentang Baros Elektronik, Pembelian dan Administrasi.



Gambar 3 Tampilan Website

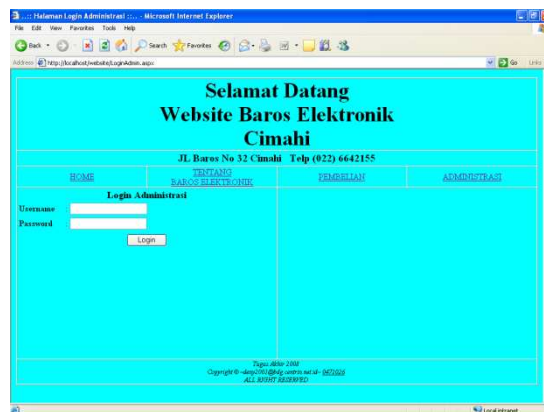
Berikut ini adalah halaman yang menampilkan tentang Toko Baros Elektronik, dan menampilkan ucapan terimakasih serta memberikan informasi bagi konsumen baru bagaimana melakukan pendaftaran dalam website ini.



Gambar 4 Tampilan Tentang Website Baros Elektronik

Di dalam website ini terdapat dua macam sistem login, yaitu: Login sebagai Administrasi dan login sebagai Konsumen. Dimana sebagai sebagai Administrasi diharuskan memasukkan username dan password. Hak akses administrasi dibagi menjadi dua bagian, yaitu administrator dan pengelola. Ketika administrasi memasukkan username dan password, sistem secara otomatis akan menampilkan tampilan yang sesuai dengan hak aksesnya. Dan login sebagai konsumen, konsumen diharuskan memasukkan username dan password.

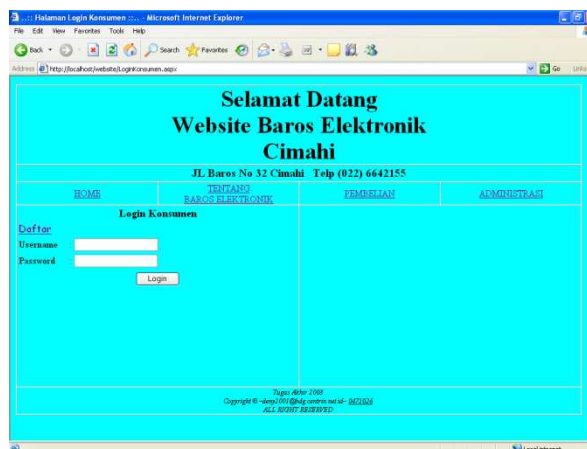
Berikut ini merupakan tampilan awal login administrasi yang merupakan salah satu kategori user untuk administrator.



Gambar 5 Tampilan Login Administrasi Dalam Website

Pada tampilan login administrasi ini, user administrasi dikategorikan menjadi 2 bagian yaitu Administrator dan Pengelola. Yang membedakan hak akses antara user Administrator dan Pengelola adalah Pengelola dapat mengakses semua fitur yang ada sedangkan Administrator hanya dapat mengelola data barang dan mengelola data user saja.

Di bawah ini merupakan tampilan Login sebagai Konsumen, dimana konsumen yang belum memiliki login dapat mendaftarkan terlebih dahulu, sedangkan konsumen yang telah memiliki login dapat langsung dan menginputkan passwordnya, seperti tampilan di bawah ini.



Gambar 6 Tampilan Login Konsumen dalam Website

Berikut ini adalah halaman bagi pendaftaran konsumen yang baru. Setiap konsumen yang baru pertama kali mengakses dan ingin melakukan pemesanan barang diharuskan mendaftarkan diri dengan mengisi daftar ini.

Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/webdata/daftar.aspx

Selamat Datang
Website Baros Elektronik
Cimahi

Jl. Baros No 32 Cimahi Telp (022) 6642155

[HOME](#) [TENTANG BAROS ELEKTRONIK](#) [PEMBELAN](#) [ADMINSTRAS](#)

Daftar Konsumen Baru

Username *)
Password *)
Confirm Password *)
Nama *)
Alamat *)
Nama Perusahaan
Email *)
Nomor Telepon *)

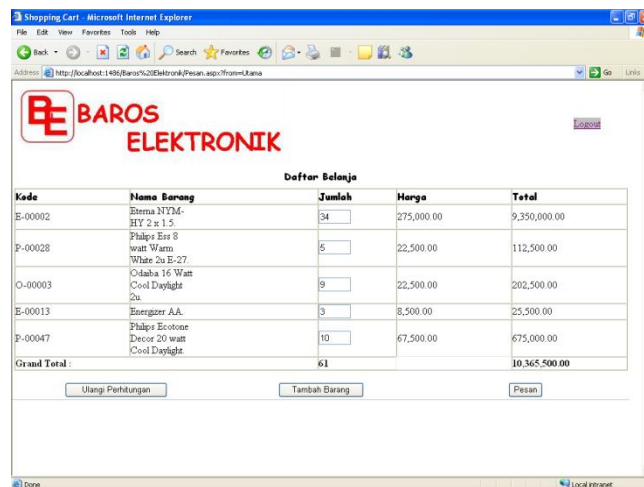
Submit

Copyright © 2008
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Gambar 7 Tampilan Pendaftaran Konsumen Baru

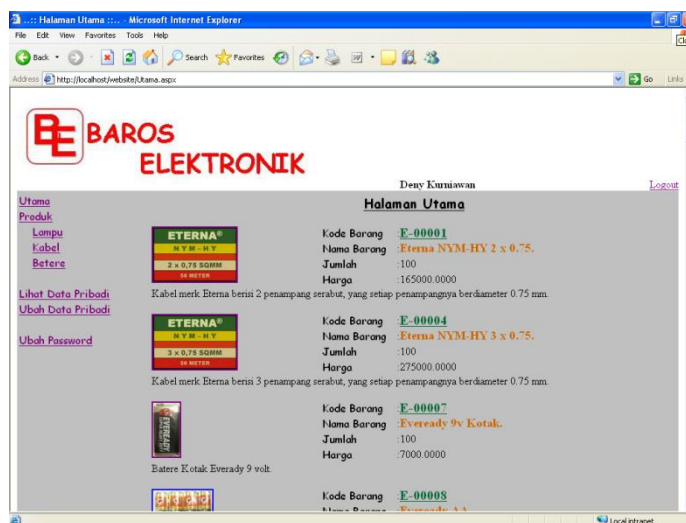
Di dalam website ini, konsumen dapat mengelola data konsumen jika terdapat perubahan data serta data pemesanan barang yang akan dibeli.

Di bawah ini adalah tampilan shopping chart, yang merupakan daftar belanjaan para konsumen yang telah dilakukan saat itu. Di dalam shopping chart ini dapat dilakukan penambahan barang, dan juga dapat melakukan perhitungan total belanja saat itu. Apabila konsumen sudah yakin dengan daftar belanjaan yang telah dipilih, maka selanjutnya konsumen harus menekan tombol pesan, agar daftar belanjaan tersebut menjadi daftar pemesanan yang akan diproses selanjutnya oleh pihak toko.



Gambar 8 Tampilan Shopping Cart

Berikut ini merupakan halaman tampilan produk terlaris, disini ditawarkan beberapa barang yang paling laris berdasarkan pemilihan pengelola. Pada halaman ini, konsumen dapat langsung melakukan pemesanan barang dengan cara mengisi jumlah produk yang akan dibeli.



Gambar 9 Tampilan Barang Terlaris

Pada halaman tampilan produk, disini ditawarkan seluruh produk yang tersedia disertai gambar, jumlah stok dan harga setiap produknya, contoh di bawah ini adalah tampilan produk lampu (Gambar 10) dan tampilan produk kabel (Gambar 11). Pada halaman ini, konsumen dapat langsung memesan barang yang diinginkan dengan cara mengisi jumlah produk yang akan dibeli.



Gambar 10 Tampilan Produk Lampu



Gambar 11 Tampilan Produk Kabel

Adapun beberapa persyaratan yang diperlukan untuk dapat mengakses website ini adalah sebagai berikut.

- Seperangkat komputer yang memiliki fasilitas yang memadai untuk pengaksesan jaringan internet beserta dengan monitor, keyboard dan mousenya.
- Jaringan Internet.

4. Kesimpulan

Berdasarkan hasil penelitian, dapat disimpulkan bahwa fitur-fitur yang disediakan dalam aplikasi Website E-Commerce Toko Baros Elektronik Cimahi dapat mencukupi kebutuhan pihak Toko, terutama untuk pengelola dan administrator serta dapat membantu para pelanggan untuk mendapatkan informasi barang yang dijual secara lengkap dan dapat melakukan pemesanan barang dimana saja dan kapan saja.

Adapun kendala-kendala yang dihadapi saat penelitian yaitu:

1. Saat stok barang habis atau jumlahnya sudah mencapai jumlah stok minimal, belum ada pemberitahuan atau peringatan secara otomatis untuk mengantisipasi ketersediaan barang tersebut di gudang.
2. Belum adanya jalur khusus secara online ke distributor dalam pemesanan barang yang sudah habis atau mencapai jumlah minimal di toko.
3. Pembayaran masih dilakukan secara manual atau transfer melalui bank.
4. Sistem penjualan belum menerapkan suatu teori penunjang khusus, masih mengadaptasi sistem penjualan yang berjalan saat ini di toko.

5. Saran

Dari semua hasil yang telah tercapai saat ini, masih mempunyai beberapa kekurangan. Disarankan untuk menambah fitur-fitur yang dapat melengkapi website ini dimasa yang akan datang. Diantaranya adalah:

1. Ditambahkan fitur yang bisa menambah stok barang secara otomatis bila stok barang habis.
2. Ditambahkan fitur yang bisa langsung berhubungan dengan website distributor untuk memesan barang yang sedang habis di toko.
3. Penambahan fitur pembayaran secara otomatis.
4. Pemberian desain website yang lebih menarik.
5. Memakai sistem penjualan FIFO (First In First Out) atau LIFO (Last In Last Out) sehingga memberikan hasil penjualan yang lebih spesifik di masa yang akan datang.

Daftar Pustaka

Frans. (2003). ASP .NET Solusi Web e-Commerce. Andi Offset

IlmuKomputer. (n.d.). Main Page – IlmuKomputer. Retrieved December 10, 2007, from <http://ilmukomputer.com/2006/08/19/pengantar-aspnet/>

A Case Study of PT XYZ on Information and Knowledge Sharing via an Improved Corporate Portal¹

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Abstrak

Arus informasi dan pengetahuan menjadi penting bagi kelangsungan hidup organisasi, khususnya untuk dapat mendapatkan informasi yang tepat pada waktu yang tepat untuk dapat merumuskan keputusan yang efektif dan tepat waktu. Ketidakmampuan untuk merumuskan keputusan yang efektif dan tepat waktu dapat mengurangi tingkat pencapaian visi dan misi organisasi. Tingkat pertumbuhan informasi dan teknologi yang relatif pesat dapat menimbulkan kebingungan bagi para pemerhati organisasi (stakeholders), secara khusus adalah ketersediaan informasi dari berbagai sumber. Information overload dapat terjadi. Untuk alasan tersebut, corporate portals ditujukan untuk dapat memberikan solusi dan alternatif, dengan cara menyalurkan dan membagikan informasi dan pengetahuan kepada para pengguna yang memerlukan. Hal ini diharapkan dapat mendorong produktifitas seluruh organisasi.

Karya tulis ini memperhatikan isu bagaimana sebuah corporate portal dapat meningkatkan pembagian informasi dan pengetahuan kepada seluruh karyawan di dalam sebuah organisasi. Studi kasus dari PT. XYZ, sebuah perusahaan

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pertambahan, yang memiliki beberapa lokasi di Indonesia, akan digunakan sebagai dasar analisa karya tulis ini.

Abstract

The flow of information and knowledge sharing is crucial for the survivability of organizations – the proper information at the right time toward effective and timely decision-making. The lack of effective and timely decision-making may result in deficiency in achieving previously prescribed organizational vision and mission. The growth rate of information and technology evolution may well lead to major confusion for stakeholders. This is mainly due to the availability of numerous information from multiple sources. Information overload may be the result. For these reasons, corporate portals are mainly intended to propose solutions and alternatives by channeling and sharing the required information and knowledge to respective users. It is expected that this will boost organization-wide productivity.

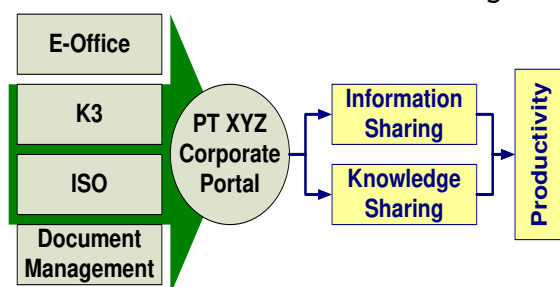
This paper focuses on the issues on how a corporate portal can potentially improve information and knowledge sharing among employees in a company. A specific case study of PT. XYZ, a multiple location mining firm is used on this study.

I. Introduction

In the recent time, the needs of quick access to various information are growing. This is not only coming from individual needs, but also from the organizational perspective. To successfully competing

in the marketplaces, organization may have to look for quick access in gathering current information. In this paper, a corporate portal is used to illustrate such needs from the organizational perspective.

Illustration 1: Framework of Thinking



II. Framework of Thinking

This study attempts to analyze at least 3 variables. First, whether corporate portal applications is able to assist employees in information sharing. Second, whether corporate portal applications is able to assist employees in knowledge sharing. Third, this study also attempts to analyze whether corporate portal applications is able to potentially increase productivity of employees by comparing the working hours before and after using the corporate portal.

III. Theoretical Reference

III.1. Definition of Portal

Generally speaking, from an information technology perspective, or otherwise referred to as "IT", a portal is a gateway that provides information from diverse sources in a customized and personalized way. Oxford Dictionary (2008) defines "portal" as *"a doorway, gate, or gateway, especially, a large and imposing one"*. Keeping this definition in mind, it portrays that a portal is an entry point into an entity. After passing through this entry point, one can move towards different paths. These different paths are connected with each other, and specific paths, depending on requirements, can be selected. Within the context of information technology, or otherwise referred to as "IT", the term "portal" is defined as *"internet site providing a directory of links to other sites"* (Oxford Dictionary, 2008). Nevertheless, most authors and researchers have defined this term differently. As in an article published by Gartner Group, the author pointed out that *"Portal is the most abused term in IT"* (Phifer, 2000). As this term is relatively new within the context of IT, there is no precise and universally accepted technical definition of portal (Hogger, et al, 2000). Yahoo! holds the honor of being the first public portal. However, before the term portal started to be used for such a framework, Yahoo! was simply referred to as a search engine.

III.2. Types of Portals

Portals can be divided into two main types; vertical portals and horizontal portals. Horizontal portals are portals with information and links to websites featuring diverse subjects. Vertical portals are portals that focus on a specific industry, community, or organization. Vertical portals are also called vortals. Ovum, a leading European consultancy and research firm in the field of telecom,

software, and IT services, divides portals in four major types, which are; specialized portals, public portals, market space portals, and organizational portals (Ramona, 2001). Types of portals can be summarized as follows;

1. Specialized portals are designed for a specific purpose (Ramona, 2001). Such portals serve a community interests in a specific topic. Communication portal for medical doctors in Indonesia², community portal for people from Sumba³, and Indonesian automotive portal⁴ are just a few examples of specialized portals.
2. Public portals offer products and services to the general public (Ramona, 2001). These portals have a much larger target market as compared to other types of portals. Yahoo!⁵, and Google⁶ can be referred to as popular public portals these days, particularly in Indonesia. Besides providing a search engine, those public portals also offer free email, web directory, news, weather forecast, and a lot of other intriguing features. Most public portals offer personalized and customized options to their potential users.
3. Market space portals support business-to-business or business-to-consumer ecommerce (Ramona, 2001). Through market space portals companies and consumers can buy and sell various products and services. These portals provide software support for ecommerce transactions. Consumers and businesses can find, and access numerous information about various products. Consumers can also participate in group discussions with other vendors and/or buyers (Ramona, 2001). Trade Worlds⁷, and the world's largest base of suppliers, Alibaba⁸, are the examples of market space portals.
4. Organizational portals serve processes and roles in a specific organization, enabling stakeholders to view information more effectively in order to understand how such information can support decision-making, and to act and respond through integrated applications (Fitzgerald, 2001; Ramona, 2001). One example of an organizational portal is a corporate portal that is specifically designed for employees in a certain organization. Its services are not just limited to the employees, but can also be extended for other stakeholders, as well. This portal offers complete information as well as necessary applications and documents to its users in a customized way needed on a daily basis. According to Fitzgerald (2001), *"Corporate portal is a secure, web-based interface that provides a single point of integration for and access to information, applications and services for all people involved in*

² It refers to www.klikdokter.com

³ It refers to www.waigapu.com

⁴ It refers to www.indomobil.com

⁵ It refers to www.yahoo.com

⁶ It refers to www.google.com

⁷ It refers to www.tradeworlds.com

⁸ It refers to www.alibaba.com

the enterprise — including employees, partners, suppliers, and customers”.

III.3. Corporate Portal

III.3.1. Definition of Corporate Portal

As previously mentioned, there is no standard definition on portal in relation to information systems. Likewise, the term corporate portal is yet to be standardized as well, as various researchers, and especially vendors in this particular field, describe this term in different ways. Terms used in professional language include; corporate portal, business portal, group intranet, enterprise information portal, or otherwise known as “EIP”, group portal, workplace portal, enterprise resource portal, and employees’ portal. Although the functions and features of all the above mentioned portals are slightly vary from each other, the purpose is identical. In this paper, the term “corporate portal” is used.

According to members of the enterprise software team at Merrill Lynch⁹, the term “corporate portal” is defined as “... *applications that enable companies to unlock internally and externally stored information, and provide users with a single gateway to personalized information needed to make informed business decisions*” (Kosasih, 2008). This remains as a valid definition by researchers in this field. Most of other definitions on “corporate portal” revolve around such a definition. Perhaps, a more specific description on “corporate portal” is as such “*provides business users with a single web interface to corporate information scattered throughout the enterprise*” (Kosasih, 2008). This definition emphasizes the collaborative and decision processing features of these applications and also recognizes it as an entry point to diverse information sources.

In addition, Murray (1999) states that “*corporate portals must connect [people] not only with everything we need, but [also] with everyone we need, and provide all the tools we need to work together. This means that groupware, e-mail, workflow, and desktop applications – even critical business applications - must all be accessible through the portal. Thus, the portal is the desktop, and your commute [to work] is just a phone call away*”. Categories to group the four most important features of any corporate portal are as follows;

⁹ **Merrill Lynch** is one of the world's leading financial management and advisory companies, providing capital markets services, investment banking and advisory services, wealth management, asset management, insurance, banking and related products and services worldwide (www.ml.com).

1. Information features, which refers to features that connect stakeholders with various information.
2. Collaborative features, which refers to features that offer collaboration capabilities.
3. Expertise features, which refers to features that connect people with other people based on their abilities, expertise, knowledge, and interests.
4. Knowledge features, which refers to features that combine all of the above and deliver personalized content based on user requirements.

From the above-mentioned definition, it is apparent that Murray (1999) emphasizes more on the features of the corporate portal than just considering it as an information gateway.

III.3.2. Characteristics of a Corporate Portal

Characteristics of a corporate portal should be thoroughly considered before implementing it to fully utilize this technology and reap the benefits resulting from it. According to Kosasih (2008), several prominent characteristics of a corporate portal include; ease of use, security, frequent updates, ability for customization/personalization, application Integration, availability of a search engine, structure of content, collaborative features, and dynamic resource access. If these characteristics are embedded in the organizational corporate portals, it may increase the potential on success rate.

III.4. Information and Knowledge Sharing

Information can be collected from various sources of data, such as; directories, news, or reports. Knowledge is the organized result of experience and information, which is used to guide actions and interactions with the outside world. Generally, every individual attempts to store knowledge in a relatively structured form. This allows easy access, when needed. During communication, individuals have to transform such knowledge, and make it visible, or audible to the outside world (Orna, 2005).

According to Kosasih (2008), Dr. Russell Ackoff, who is a systems theorist and a professor of organizational change, once stated that the content of the human mind can be classified into five categories; **data** (raw; simply exists and has no significance beyond its existence), **information** (data that are processed to be useful; provides answers to "who", "what", "where", and "when" questions), **knowledge** (application of data and information; answers "how" questions;

knowledge is the appropriate collection of information), **understanding** (appreciation of "why"), and **wisdom** (evaluated understanding). In addition, Ackoff indicates that the first four categories relate to the past, which deals with what has been or what is known. Only the fifth category, wisdom, deals with the future because it attempts to incorporate vision and design. With wisdom, people can create the future (Kosasih, 2008). A corporate portal may put forth a solution to become the media, which provides knowledge, information, and data to the right individuals at the right time. For this reason, the term "corporate portal" is so closely connected with the term information and knowledge sharing.

III.4.1 Information Sharing

It is stated previously, information is a bundle of useful data, which attempts to provide answers to questions of "who", "what", "where", and "when" (Kosasih, 2008). This bundle of data needs to be shared as a way to add more meaning to such data.

Gauvin, et al. (2004) describe that *"Information sharing refers to the ability to find and share relevant information between participants in a project."* This is supported by Anantadjaya (2007), and Spies, et al. (2005), who indicate that during the past decades, information integration has become the major issue in large organizations. In fact, information sharing has become the key indicator for success. The most prominent inhibitors and risk factors, include; the vast amount and the huge growth rate of all kinds of documents (from e-mails to project descriptions and reports), the significant variety and complexity of IT infrastructure applied in medium to large enterprises (from legacy systems to modern web servers), the dissemination of corporate knowledge across structured formats (like in relational databases), and unstructured formats (like in text and office documents), partly missing know-how to scan results from these heterogeneous resources for content relevant to specific work, as well as learning how to improve search techniques, the variety of languages and terminologies in use. Corporate portals claim their importance by integrating information and services within an organization, and pull those various information into a single place (Zibler, 2007).

III.4.2. Knowledge Sharing

Corporate portals are an excellent media for managing knowledge, which are originally sourced out from both inside and outside an organization.

Looking from a bigger picture, the Ministry of Communication and Information Technology of the Republic of Indonesia (Anantadjaya, 2007) has put together a blue-print toward improving the country's human resources on information and communication technology. From the blue-print, it can be conferred that upgrading the quality of human resources depends on information. As human resources become more aware of information, the level of awareness is likely to increase. As the level of awareness increases, citizens of Indonesia are expected to become more knowledgeable. Advances on human resources knowledge would likely boost competencies on doing things, thus, developing the quality of human resources in Indonesia. The above mentioned blue-print, distinguished 5 (five) key success factors¹⁰ toward a smooth implementation of such a blue-print. Those key success factors are; strong leadership, appropriate skills, system incentives, sufficient resources, and sets of action plans. Shortages in any of those key success factors may lead to unsuccessful incompleteness of the blue-prints. Hence, it is important to have all ingredients mixed together in order to reach the full intention of change and improvement of the human resource.

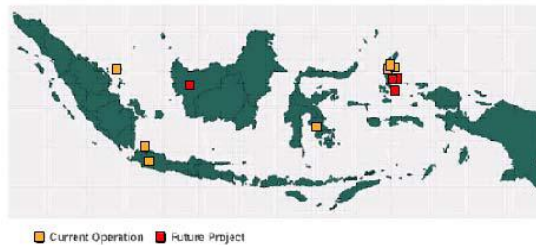
Therefore, it can be inferred that effective use of knowledge management, or otherwise known as "KM", could enhance productivity. Corporate portals can potentially increase the rate of collaboration and knowledge sharing activities among employees, regardless of their actual locations.

IV. Research Object

¹⁰ According to the Center of Research of the Ministry of Communication and Information Technology (Anantadjaya, 2007), the fulfillment of all five ingredients will lead to change. One should note that there are five potential results when any of the elements are missing. First, the stage of confusion exists when there is no strong leadership to escort the process. Second, the stage of anxiety exists when there are no appropriate skills that have been acquired by the people, yet those people must immediately understand the intricacies of change in relation to the information and communication technology. Third, the stage of stagnancy exists when there are no system incentives. Fourth, the stage of frustration exists when there are insufficient resources to support the necessary changes. Fifth, the stage of false start exists when there are no action plans, which details the path and direction to go.

PT. XYZ is a state-owned mining company with its head office located in Jakarta. PT. XYZ has five sub-business units located outside Jakarta. In order to sustain profitability, fast and accurate information and knowledge sharing through the organization is critical. However, information overload is a constant threat to productivity. For example, when an employee needs to get updated information from multiple sources, with a vast amount of information available, and without any collaboration, this employee will be overloaded with so much information, and it will take him/her a long time to sort-out the particulars his/her needs.

Illustration 2: Locations of PT. XYZ



Source: Kosasih, 2008

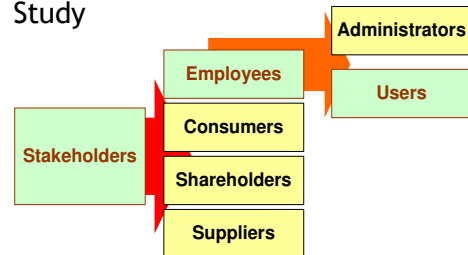
Organizations, whose structures rely on functionalities, which comprises on departments, and sub-business units, may need to communicate critical information quickly and securely across the board. Like many state-owned mining companies, PT. XYZ had used e-mail and a rudimentary intranet as primary communication mechanism. At the present time, a portal, which provides a webpage with hyperlinks to reports, policies, and forms issued by various departments in shared folders, is being used by PT. XYZ. This system has limitations, such as; lack of security, poor document management tools, multiple login, and lack of search capability.

Continuous growth and increasing competition have made it necessary for PT. XYZ to establish a better, more cost effective electronic communication system for its headquarters and sub-business units. The new system had to streamline all aspects of the company's business processes. PT. XYZ has decided to adopt a licensed program to assist its 1,500 employees to collaborate more efficiently via the creations of an enterprise portal and collaborative team sites. The portal, based on Microsoft Office SharePoint¹¹, is the central source of daily information for all PT. XYZ employees. This portal attempts to overcome one of

¹¹ Microsoft Office SharePoint Server is a world class enterprise portal platform that makes it easy to build and maintain portal sites for every aspect of your business (www.microsoft.com).

the biggest challenges in the modern society; that is, information and knowledge sharing. This corporate portal would allow departments or work groups within PT. XYZ business units to create team sites. This is expected to improve collaboration and sharing the best practices.

Illustration 3: Limitation of Study



V. Limitation of Study

Corporate portals cover the information needs of employees, suppliers, customers, and other stakeholders. This paper attempts to focus only on the issues related to the employees of PT. XYZ. Employees of PT. XYZ are used since those employees represent the ultimate users of the corporate portal in an organization. This paper uses PT. XYZ as a case study, in particular, during the implementation of an improved corporate portal in one single organization. Questionnaires were distributed to PT. XYZ employees in the company's headquarters and in one of the company's sub-business units.

VI. Measurements

This paper attempts to quantify the information and knowledge sharing via a corporate portal by incorporating several mathematical measurements, such as; productivity, payback period, return on investment ("ROI"), and return on capital employed ("ROCE"). These measurements are expected to support the qualitative analysis on costs and benefits on the implementation of corporate portals in an organization.

VI.1. Productivity

The term "productivity" can be simplified to refer to the ratio of output to input. Productivity is an important managerial decision-making factor as a way to determine the efficiency level of input, and effectiveness of the production processes, in the final attempt to achieve the highest earnings possible for the organization (Baye, 2006). Hence, the more input required to produce the same level of output is portrayed as a decrease in productivity. According to Baye (2006), calculation on marginal products is best to portray the level of productivity. Managers should note the increasing range on marginal returns

since this range represents the most productive region for an organization. Formulas on marginal products can be expressed as follows;

- Marginal product for capital invested in an organization can be stated as $MP_K = \frac{\Delta Q}{\Delta K}$, where “MP_K” refers to “marginal product capital”; “ ΔQ ” refers to “change in total output”, and “ ΔK ” refers to “change in capital”.
- Marginal product for labor can be stated as $MP_L = \frac{\Delta Q}{\Delta L}$, where “MP_L” refers to “marginal product labor”; “ ΔQ ” refers to “change in total output”, and “ ΔL ” refers to “change in labor”.

According to Baye (2006), two important factors, which can potentially bring direct influence into the level of productivity are; improvement in capital¹², and labor skills. Implementation of a corporate portal in an organization may indicate a signal toward technological improvements. A corporate portal serves as an information and knowledge gateway for employees in an organization. Hence, corporate portals allow employees to get updated information. As users of any corporate portals share the correct information and knowledge more quickly, time saving and energy are undoubtedly apparent. The available time can certainly be utilized to complete other tasks. This may be a signal toward an increase in productivity within an organization. Productivity is certainly a critical measurement for organizations to sustain profit margins, and market shares, in the highly unstable economic conditions.

VI.2.Determining Benefits and Costs of a Corporate Portal

Many costs and benefits of information system are difficult to quantify. IT appears too deeply embedded into most business processes to be isolated as a variable (Laudon and Laudon, 2002). The impact of a single technology investment may be difficult to ascertain, if it is affected by other interrelated system and multiple layers of hardware, software, database and networking technology in the firm's IT infrastructure. Capital budgeting is indeed necessary to start analyzing and selecting various proposals for capital expenditures concerning corporate portals. Three models of capital budgeting are commonly used to evaluate investment projects; payback period, ROI, and ROCE.

¹² In this paper, the term “capital” is referred to “technological capital”, which includes any equipment (hardware and software) on technological improvement.

VI.2.1. The Payback Method

Payback method measures the estimated time required to pay back the initial investment on a particular project. The payback compares between the initial investment and the projected annual cash inflows that a particular project can potentially bring-in (Laudon and Laudon, 2002). Payback method is a popular measurement due to its simplicity and “initial screening” power.

VI.2.2. Return on Investment

Firms make capital investments to earn a satisfactory rate of return. Determining a satisfactory rate of return depends on the cost of borrowing at the prevailing market rate. Others factors can enter into the equation, such as; the historic rate of return expected by the firm, inflation rate, as well as the risk-free rate. In the long run, the desired rate of return must equal or exceed the cost of capital in the market place. ROI calculates the rate of return from an investment by adjusting the cash inflows produced by the investment for depreciation. It gives an approximation of the accounting income earned by the project. Laudon and Laudon (2002) suggest the following formulas to calculate ROI;

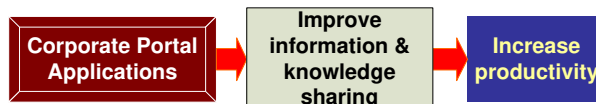
- $NB = \frac{(TB - TC - Depreciation)}{UsefulLife}$, where “NB” refers to “net benefits”, “TB” refers to “total benefits”, and “TC” refers to “total costs”.
- $ROI = \frac{NB}{TIC}$, where “TIC” refers to “total initial costs”.

VI.2.3. Return on Capital Employed

It is somewhat misleading to assess profits, or profit growth without relating it to the amount of capital that was originally employed in making such profits. ROCE is one of the most important profitability ratios, which attempts to assess how much the capital invested has earned during the period. ROCE is an indicator of how well a company utilizes its capital in generating revenues. In other words, ROCE is the rate of return a business is able to realize based on the total capital employed in the business.

Illustration 4: Causal Study

Walsh (2005) suggests this formula $ROCE = \frac{EBIT}{(TA-CL)}$, to



calculate ROCE, where “EBIT” refers to “earnings before interests and taxes”, “TA” refers to “total assets”, and “CL” refers to “current liabilities”. Comparing the current value of ROCE to the previous ROCE may be beneficial to evaluate the internal variations.

VII. Research Methodology

Data collections were conducted from March 2008 to July 2008, directly in PT. XYZ (Kosasih, 2008). Both the secondary and primary data sources were explored.

Primary data is collected to get the qualitative and quantitative data from the prospective users of a corporate portal, by means of direct observation, informal interview, and survey, where 130 questionnaires were distributed via email (sub-business unit outside Jakarta), and paper-based (in Jakarta) to employees of PT. XYZ.

The population was employees of PT. XYZ in Jakarta office, and one sub-business unit outside Jakarta, who have attended the user acceptance test (“UAT”) on the new corporate portal. Jakarta office was simply selected due to its accessibility. A similar reason was used to select one sub-business units outside Jakarta. Out of this targeted population, final selection criteria were merely on the basis of availability of employees in PT. XYZ in those two office locations, at the time of study. Undoubtedly, the most easily accessible employees were automatically chosen as respondents.

Secondary data used in this study were mainly from PT. XYZ, and PT. Synetcom Lintas Buana (“SLB”). Secondary data were expected to reveal answers toward the development progress of a new corporate portal project and its effects on the improvement of information and knowledge sharing among employees, who are located in different locations of multiple business units.

This paper incorporates a causal study to determine the cause-and-effect relationships to draw a conclusion toward the increment of productivity level in an organization. In particular, the following queries are formed to guide the research process, as follows;

1. Can a corporate portal improve information and knowledge sharing among employees in an organization?
2. Can E-office applications in a corporate portal increase productivity?

VIII. Results & Analysis

The following results and analysis are mainly based on responses on questionnaires, findings from unstructured interviews, and observations (Kosasih, 2008). The illustration on “causal study” mirrors the initial framework of thinking of this paper.

The questionnaire is divided into 4 (four) parts, to cover demography, productivity, frequency, usefulness and benefits. This section focuses on the demographic data to learn the basic characteristics of users. A total of 140 (one hundred and forty) questionnaires were distributed; 40 (forty) were sent by e-mail to PT. XYZ sub-business unit outside Jakarta, and 100 (one hundred) were manually handed out to employees in Jakarta office. Out of the 40 (forty) e-mails sent to PT. XYZ sub-business unit outside Jakarta, 30 (thirty) completed questionnaires were returned. Out of the 100 (one hundred) questionnaires distributed to employees in Jakarta office, only 73 (seventy-three) were completed. Hence, a total of 103 (one hundred and three) returned questionnaires were available for use. This represents about 21% of the total employees, who would become the prospective users of the new corporate portal in the Jakarta office, and sub-business units outside Jakarta. In the Jakarta office, the questionnaires were distributed during UAT, and employees were guided to fill-out the questionnaires. In the sub-business unit outside Jakarta, the questionnaires were e-mailed. Employees were requested to complete the questionnaires immediately following UAT.

VIII.1. Respondents' Characteristics

Of the total of 103 (one hundred and three) questionnaires, the following can be summarized;

1. Respondents are registered as employees in 16 different functional divisions within PT. XYZ, such as; HR, Accounting, PR, Budgeting, Business Development, General Affairs, IT, Learning and Assessment, Marketing, Risk Management, Treasury, Quality Control, Procurement, Health and Occupational Center, Quality Management Assurance, and Safety.
2. Male respondents dominate the sub-business unit outside Jakarta.

3. Approximately 63% (sixty-three percent) of respondents are married.
4. Approximately 90% (ninety percent) of respondents are positioned as staff.
5. Approximately 52% (fifty-two percent) of respondents have been working with PT. XYZ for more than 5 years.
6. Approximately 58% (fifty-eight percent) of respondents' monthly income are more than Rp. 5 million.
7. Approximately 71% (seventy-one percent) of respondents hold undergraduate degrees.
8. Approximately 70% (seventy percent) of respondents use computer up to 6 (six) hours each day.
9. Approximately 53% (fifty-three percent) of respondents use internet up to 6 (six) hours each day.

VIII.2. Information Sharing & Knowledge Sharing

Due to the limitations of the prior corporate portal, PT. XYZ comes up with another project to improve its prior corporate portal by developing a newly and improved corporate portal. PT. XYZ has appointed SLB to handle the project. This portal has already been implemented in the head office in Jakarta, as well as in all other 5 locations of sub-business units as of July 2008. The newly and improved corporate portal system development for PT. XYZ include the following;

1. Developing E-office applications with a function to support the daily work process of the employees.
2. Developing document management applications as the new formation of a digital bookshelf.
3. Developing ISO and K3 applications to support sub-business units of PT. XYZ.
4. Improving the design and lay-out of the corporate portal, with a better and more user-friendly concept.
5. Integration of database and electronic mailing systems.

Concerning the information and knowledge sharing, responses from respondents indicate the following;

1. Approximately 53% (fifty-three percent) of respondents strongly agree that a corporate portal improves information and knowledge sharing among employees within an organization. A corporate portal with all its applications has the high potential to assist employees in multiple locations. As it enhances the collaboration among employees, a corporate portal might improve information and knowledge sharing across the entire

organization. Respondents appeared to have a clear grasp of this potential benefit.

2. Approximately 82% (eighty-two percent) of respondents were relatively in agreement that a corporate portal could potentially improve the organizational process flow. Through the use of E-office applications, document management, ISO and K3 applications, processes should improve since the standardized workflow systems are built-in in the corporate portal.

VIII.2.1. E-Office Module

The main purpose of E-Office applications is to support daily activities of PT. XYZ employees. Since workflow applications in E-Office module are conducted under a web-based portal, all business processes from one desk to another are automated. These applications are used by the employees in the head office and its sub-business units. Features on E-Office module include;

1. Integrated with active directory, for user identification and security level.
2. Reminder alert for unprocessed tasks via e-mail
3. Automatic reporting system.
4. Collaboration with the database system.
5. Confirmation via e-mail.
6. Integrated procedural rules and regulations.

Sub-categories of E-Office module are;

1. Formal letter.

This application in the corporate portal is called *Nota Dinas*. It is merely used for internal communication. In fact, a *Nota Dinas* has the same purpose as an e-mail, which is to communicate announcements, requests, and complaints. The only difference is that a *Nota Dinas* is more formal and has its own draft. This application applies to sender(s) of formal letter and receiver(s) of formal letter. Advantages of this application are automation, reduction of paper work, and minimization of time needed for distribution of formal letters.

The expected information and knowledge sharing is that after writing a formal letter, the sender is able to select the receiver(s) from the database. Through the sub-categories of “formal letter”, information can be directed fast to the intended recipient(s), including other concerned recipient(s), using a carbon copy feature. Recipients of this “formal letter” have the

opportunities to make comments about the contents of the letter. Hence, information can be relayed to multiple individuals at once.

2. Business travel.

This application consists of time, date, details of trip, locations to be visited, transportation requirement, and names of individuals on the proposed trip. Names of employees are listed in the database. The respective managers can verify the details faster and easier, prior to approvals. If approvals from upper management team are required, this information can be easily relayed. Likewise, once approvals are granted, this information can be transmitted to the department of human resources ("HR") to finalize the business trip procedures. Once this information is processed by HR, it is passed onto the department of finance, to arrange the necessary funds and/or documents. Upon return from the business trip, employees must provide report to HR and finance to settle the expenses incurred during the business trip.

The flow of this application provides evident that information is shared to concerned individuals. Knowledge is also shared since this application contains of database of pertinent rules and regulations of PT. XYZ on business trips, and automatic calculators to estimate the travel expenses.

3. Leave management.

This application is used for managing and tracking leaves of employees. Employees can easily view how many days of leave that they have taken, how many days of leave that they still have accumulated, and leave requests are in-process. This application pertains to all employees. There are 10 (ten) types of leave available within this sub-category; annual leave, sick leave, training, work leave, maternity leave, joint leave, hajj leave, unpaid leave, dispensation leave, other leave. Advantages of this application include; automation, reduction of paper work, minimization of time needed for leave management request, adaptation to the rules and regulation of leave management system, and opportunity for employees to view their days-off status.

The flow of information and knowledge sharing in this application is that employees have to check their remaining leave days in their leave management application first. If they have days left, employees can fill out the leave management form. On the contrary, if an employee does not have any days left, he or she cannot continue the process. This information is

conveyed to manager and director. The manager and director have the authority to grant their permission to the request before it is passed onto the Human Resource management. Through this process the manager and director are always informed when an employee intends to take days-off and can consider various factors, such as; whether the employee is currently involved in an important task, or whether the overall work processes are going to be effected by his/her decision to take leaves of absence. HR will give the final approval on the leave request, and will also inform the employee via the leave management system.

4. Employee Self Service ("ESS").

With this application, employees can share lots of information, if they want to, about family, career, experience, rewards, and educational background. Advantages of this application are less paper work in maintaining employee information, and employees are able to update their own data on an individual basis.

The flow of information and knowledge sharing in this application is that employees are able to update their personal data. HR holds the final approval on those changes. This information sharing is very useful for colleagues to get to know each others, while managers can check ESS for both formal and informal educational or experience records of employees to select suitable individuals for assignments. Some ESS data are classified, which can only be accessed by managers. This includes employees' salary information.

5. Help desk.

Help desk is an application for IT-related issues. These IT-related issues include; hardware and software queries. By using this application, employees are able to find advice for their IT-related issues, and immediate linkage with experts.

Via this help desk sub-category, information and knowledge is shared when employees fill-in the help desk form with IT-related queries, and brief descriptions of the problems. After an employee fills this help desk form, the systems will automatically notify the help desk administrator in their IT unit. There are 4 (four) steps to solve an issue;

- a. Via portal – information is processed to be knowledge. The help desk administrator analyzes the problem. If the problem is related to software, IT development is contacted. If the problem is caused by

malfunctioning of hardware, IT support is contacted. When the solution for the problem has been found, an employee will directly receive the necessary guidelines to fix the concerns via the portal.

- b. Call/visit – if it is not possible to solve the problem via the portal, the employee will be called or visited.
- c. Coordination with Headquarters – if neither the call nor the visit can solve the problem, the head office in Jakarta will be contacted to analyze the problem. The employee will be contacted directly from the head office in Jakarta via e-mail or telephone.
- d. Search for vendor, or request new tenders. If the problem still exists, the head office will try to find a vendor, or request a new tender from other companies to solve the persistent IT problems.

In the help desk application, the flow of information and knowledge sharing can be clearly visualized. As first step, the employee has to try to solve the problems from knowledge and information passed on to him/her by the IT department.

6. Vehicle request

This is used when employees need to request a vehicle for business and office purposes. The department of general affairs (“GA”) of PT. XYZ needs this application to facilitate and coordinate all vehicle requests more easily. People involved in this application are employees and general affairs department. Advantages of this application include; automation, and reduction of paperwork.

The information and knowledge sharing in this application start when employees fill-out the vehicle request form. This information is passed-on to GA for further processing.

7. Meeting room request

This “meeting room request” application is used when employees need to request meeting rooms for business meetings. Through this application the process of booking a meeting room by PT. XYZ employees will be substantially simplified. Advantages of this application are automation, reduction of paperwork, and employees have the opportunity to check the availability of meeting rooms.

The information and knowledge are shared when employees fill-out the meeting room form. This form includes the following information; room information, purpose of the meeting, date and time, number of people who will attend the meeting, list of prospective meeting participants, and list of food requirements. The meeting room supervisor will check the availability, in accordance with the request, and sends confirmation for the food request. This application only relays information from employees to GA.

8. Stationary request

This “stationary request” application is used when employees need to request stationery. The basic reason why PT. XYZ wants to have this application on the web is mainly due to an increasing stationery requests. This application helps the GA staff to minimize their works in handling such requests. Advantages of this application are automation and reduction of paperwork.

The flow of information and knowledge sharing start when employees need stationery. Following the approval from the manager, the request form will be directly distributed to GA. This application only provides information flow one-way, from the concerned employees to the GA, similar to the vehicle request. Managers have constant information about how much, and which stationery is being used by employees.

The following table shows the average responses based on each of the sub-categories in E-Office module.

Table 1: E-Office Module

	Formal Letter	Business Travel	Leave Management	Employee Self Service	Help Desk	Vehicle Request	Meeting Room Request	Stationary Request
Average	4.1	4.0	4.5	3.7	3.9	2.8	2.4	3.1
Cumulative average of E-Office Module	3.6							
Source: Kosasih, 2008								

Referring to 103 (one hundred and three) respondents, the average usefulness of E-Office applications is 3.6. Based on the Likert 5-scale, where “1” refers to “strongly useless”, and “5” refers to “strongly useful”, this indicates that the final user rates the E-Office applications in the range between neutral and useful. The highest range is “leave management” with an average rate of 4.5, which indicates that this feature is useful. The lowest ratings include “meeting room request”, with an average of 2.4, and “vehicle request”, with an average of 2.7. These indicate that users appear to be relatively indifferent on the usefulness of these features. Hence, PT. XYZ needs to pay a closer attention on these features.

VIII.2.2. Document Management Module

This module is helpful for managing document distribution among employees. It saves paper, saves employees’ time in manual search for any particular documents, and saves office space since all documents are saved in digital format.

General features of this document management module include the following;

1. Space of documents for individuals, groups, and departments.
2. Integrated active directory for user identification and security level.

3. Supported by document management features;
 - a. Document search, by classification and profile key.
 - b. Collaboration.
 - c. History tracking (information when and by whom the document was edited the last time).

Several applications are available within this document management module.

1. Document Storage

Each department will have its own sub-menu in document management applications. Documents in Microsoft Office format, PDF (Portable Document Format), and image format (such as JPG, TIFF) can be uploaded and kept in this own sub-menu.

2. Document Search

This feature is used for searching a document by providing specific information about the documents' criteria, such as; subject, file name, document number, content, period, file type, owners, or source. This search will access all documents available in the corporate portal.

3. Document Archive

Archived documents will act as a digital bookshelf for the organization's uploaded documents.

4. Document Distribution

This is used to specify the security of issued documents. Certain documents can only be accessed by specific departments. When a document is uploaded to the system by an employee, access options to departments or individuals have to be selected. Every portal user has different needs to fulfill his daily activities, and it is also possible that a piece of information accessed by one user is restricted to another (White, 1999).

Information and knowledge sharing flow in this document management application start when employees search for, or posting documents, and can access essential information at the right time and in the right location. In this application, the flow of knowledge is initiated by a document issued by an employee, who was originally uploaded such a document, and carries information and knowledge to other individuals and departments within PT. XYZ.

The following table shows the average responses based on each of the sub-categories in Document Management module.

Table 2: Document Management Module				
	Document Storage	Document Search	Document Archive	Document Distribution
Average	4.1	4.0	3.7	2.5
Cumulative average of Document Management Module	3.5			
Source: Kosasih, 2008				

Based on the replies from 103 (one hundred and three) respondents, the average of all document management applications and features is around 3.5. Based on the Likert 5-scale, where “1” refers to “strongly useless”, and “5” refers to “strongly useful”, this indicates that the final user perceive document management applications between neutral and useful. The highest rating in document management is “document search”, with an average of 4.0, which can be said that respondents find this feature useful. Undoubtedly, this search feature is useful since it assists employees to find files easily. The lowest rating of 2.5, was for “document distribution” feature, which means that respondents do not consider this feature as useful. The main reason for this relatively low result may well be due to the minimal understanding of the real benefits of this feature.

VIII.2.3. ISO Module

An ISO standard is a documented agreement containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or standard of procedure to ensure that processes are fit for their purpose - such as the safety, reliability, and efficiency. Two of PT. XYZ sub-business mining units have been accredited with ISO 9001 - Quality Management Systems and ISO 14001 for Environmental Management Systems.

These ISO module applications are expected to assist employees of PT. XYZ to maintain its ISO 9001 and ISO 14001 in areas, such as; internal audit, external audit, incompatibility of production, observation, customer complaints, progress, purpose, and goal. This application helps integrating the process with a capability to directly prepare the report of correction and prevention action. If corrections or preventions of the above activities have to be carried out, the person(s) responsible need to fill in a "correction performance form". The previous correction and prevention action form used only manual input, which made the process very inefficient. Sometimes, during the process, papers were easily misplaced due to many persons involved in filling such papers. This ISO processes are controlled by the department of quality control ("QC") of PT. XYZ.

Advantages of this application are certainly automation, reduction of paperwork, supporting PT. XYZ for maintaining its ISO accreditation and automatic managerial reports. Several notable features of this ISO module are worth noted;

1. Correction and prevention action input form
2. Workflow based ISO procedure
3. Searching features
4. Problem solving
5. Deadline alert monitoring
6. System will send deadline alert via e-mail
7. Reminder alert for problem
8. System will send reminder alert via e-mail
9. Integrated reporting system

Information and knowledge sharing flow in these applications start when one responsible team/department finds out that correction and prevention actions might be necessary in another department. This team/department will inform the manager and the assistant manager of the department accused of not working according to ISO standard by filling in the correction and prevention form available in the portal. Then the two accountable persons, the assistant manager and the manager of the

accused department, will take the following action; the assistant manager will fill-in the correction and prevention form, identifying the cause and establishing a deadline to solve the problem. Then the correction and prevention form will be approved by the manager. Following the receipt of this approval, the assistant manager and his team will implement the correction and

prevention action. One person from QC will supervise and guide the correction and prevention actions. This person will give verification whether the correction and prevention actions are appropriate and meet the deadline.

Several applications are available within ISO Module;

1. Internal Audit

This application is used for the internal auditors to report the result of any findings during the auditing activities. Internal auditors are employees of PT. XYZ, who are responsible for constant assessment and evaluation of internal control. Audits are performed to ascertain the validity and reliability of information, including provide an assessment of the system's internal control.

2. External Audit

This is used for external auditors to report the results of their findings during auditing activities. Normally external auditors review a company's information technology control procedures when assessing its internal controls.

3. Incompatibility of Production

This application is used when a work group becomes aware of production incompatibilities. The operations department in sub-business unit is responsible for investigating incompatibility of production. This process helps improving production activity and productivity in the sub-business units of PT. XYZ.

4. Observation

This application is used when a group of observers finds out that corrections during activity are necessary. This observation is controlled by the department of quality management assurance ("QMA"), which schedules one observation at random departments of the sub-business units, in order to identify the need of any corrections and preventive actions.

5. Consumer Complaints

This is an application used when there are complaints about the

organization's products, from both internal and external consumers.

6. Progress, Purpose, and Goal

This application is used when some barriers in the progress of reaching the company's purpose and goals have been detected. Each month, every sub-business unit establishes its goal to reach a certain production target. If this production target cannot be reached, every department has the right to investigate the problem and report it using the correction and prevention action in this ISO application.

The following table shows the average responses based on each of the sub-categories in ISO module.

Table 3: ISO Module						
	Internal Audit	External Audit	Incompatibility of Production	Observation	Consumer Complaint	Progress, Purpose and Goal
Average	4.1	4.3	4.4	4.1	4.3	4.5
Cumulative average of ISO Module	4.3					
Source: Kosasih, 2008						

According to the observations during the UAT, the enthusiasm of the future users was clearly visible, and they are all really looking forward to using these ISO applications. As this application will be used by sub-business units, the above table indicates responses only from 30 respondents from PT. XYZ's sub-business unit outside Jakarta. The average usefulness of all ISO applications is around 4.3. Based on the Likert 5-scale, where "1" refers to "strongly useless", and "5" refers to "strongly useful", this indicates that the final user perceive ISO applications as useful.

VIII.2.4. K3 Module

K3 is the abbreviation of *Keselamatan dan Kesehatan Kerja*¹³. Basically, the flow of this module is identical to the ISO correction and prevention form modules. The only difference is that K3 module focuses only on safety and healthy working conditions. This module may be mostly used by the employees of sub-business units. When corrections are needed after investigations, the person responsible has to fill-in the “correction and performance form”, which is exactly like the one in the ISO module.

Several features of this module include; problem solving deadline monitoring, reminder alert for problems, visit card printing and monitoring, electronic penalty system, and integrated reporting system.

There are 3 sub-categories within K3 module;

1. Visit

This application is used for guests' permission to visit PT. XYZ sites. This application is categorized as K3 because PT. XYZ wants to guarantee the safety of the guest during their visits. Guests will be requested to fill-out some information regarding their plan to stay on the site. Based on the propose length of stay on the site, guests will be given an entry permit, or otherwise known as visa¹⁴.

Advantages of this application are automation, reduction of paper work and easier maintenance of guest visits.

Flow of information and knowledge sharing in this application start when guests fill-out registration forms upon arriving at PT. XYZ premises. If guests are not planning to visit a particular site, outside the head office in Jakarta, the department of public relations (“PR”) needs to only enter guests' data into the guest book. If guests were planning to visit a particular site, for instance, a visa to visit a particular site would have to be requested. In this application, the information flows from the guest to the PR, or the department of safety and environment (“SE”) to the administrator.

¹³ A free translation into English, may be stated as “safe and healthy working conditions”, which attempt to assure the well-being of employees in PT. XYZ (Kosasih, 2008).

¹⁴ There are 3 (three) types of visa: green visa (valid for 1-2 day visits, and issued by PR), yellow visa (valid for 3 days to 3 weeks visits, and issued by SE), and orange visa (valid for more than 3 weeks visits, and issued by SE).

2. Safety Patrol and Inspection

This application is used toward prevention or correction should accidents occur during the production process. During the inspection, a safety officer will make sure that the entire production process is safe for employees. If any inappropriateness were to occur during the inspection, the correction and prevention action form would have to be filled-out, and ISO directions would have to be immediately followed. Such an inspection can be either planned in advance, or at random.

Advantages of this application are automation, reduction of paper work, and less accidents due to the concentration to ensure employees' safety. By upholding safety for employees, it is expected that the chances of accidents are drastically minimized.

Information and knowledge sharing in this application flow from safety officers as well as from any other departments, with the attempts to find any inappropriateness. If the inspection results were acceptable and no inappropriateness were found, the case would be closed. However, if any inappropriateness were detected, the responsible officer would have to fill-out the correction and prevention action form. The responsible officer and management of the respective departments will take control until this inappropriateness is resolved. Once the inappropriateness is resolved, the case is closed. Thus, this application flows information from the responsible officer(s) to the management. Through filling-out the correction and prevention action form, the knowledge flows from people, who have responsibilities within this application, to other people, who may have no responsibilities on this issue.

3. Inspection of Accident and Near Miss

This application is used for inspection of accidents and near misses occurring during the production process. The sub-business units of PT. XYZ expect that the number of accidents and near misses can be minimized due to the automation of production process. Also, this inspection process is substantially faster than the previous manual process.

Advantages of this application are automation, faster result, and reduction of paper work.

Flow of information and knowledge sharing in this application start when safety officer processes an investigation of, and reporting any near misses accidents, or accidents. Usually, such investigations occur on an unplanned basis since it will only be carried out if a sudden accident or near miss occurs in the production floors. During the investigation, a safety officer needs to classify several types of near miss or accident, as follows; near miss¹⁵ (although there has been a risk, nobody was injured), small accident¹⁶ (first degree accidents with small, bloodless injuries which can be handled by the health center), insignificant accident¹⁷ (second degree accidents with injuries larger than in first degree accidents, but can be handled by the health center), and heavy accident¹⁸ (third degree accidents cannot be handled by the health center, and where it is necessary to transfer the injured to a hospital), and deadly accident¹⁹ (fourth degree accident causing death. In this case, health center will have to transfer such cases for further examinations in a hospital). This application helps to reduce the time needed to process information flow from one department to the next. In cases of accidents the time factor is very crucial and increased speed applied to all necessary procedures can prevent serious illnesses and losses of life.

Table 4: K3 Module			
	Visit	Safety Patrol & Inspection	Inspection & Near Miss
Average	3.3	4.5	4.9
Cumulative average of K3 Module	4.2		
Source: Kosasih, 2008			

¹⁵ Examples on this type of accidents are; fallen trees, landslides, and broken machinery (Kosasih, 2008).

¹⁶ Examples on this type of accident are; tiny wounds, falling down, and sprained ankle (Kosasih, 2008).

¹⁷ Examples on this type of accidents are; cuts, and breaking bones (Kosasih, 2008).

¹⁸ Examples on this type of accidents are; car crash, major blood losses, and hit by objects (Kosasih, 2008).

¹⁹ Examples on this type of accidents are; mining accidents, collisions, and lack of oxygen (Kosasih, 2008).

As this application is also going to be used merely by the sub-business units, the calculation only focuses on the 30 respondents from one sub-business unit outside Jakarta. The average usefulness of all K3 applications is around 4.2. This indicates that the final user rates the K3 applications in the range of useful.

VIII.2.5. All Available Applications

The overall average of usefulness indicates 4.0²⁰ (Kosasih, 2008), which means that respondents believe that their daily tasks can be effectively supported by these applications.

VIII.3. Productivity

In order to calculate the proper productivity, the average time required prior to the implementation, as well as the average time needed following the implementation are essential.

Table 5: Time Comparisons							
Total Average	BEFORE			AFTER			Scale
	Input	Output	Total	Input	Output	Total	
	3,111.38	7,167.73	10,279.11	82.79	969.58	1052.37	Minutes
	51.86	119.46	171.32	1.38	16.16	17.54	Hours
	2.16	4.98	7.14	0.06	0.67	0.73	Days
Source: Kosasih, 2008							

Notes:

1. The average time required "before" indicates the average of the total time required for respondents to do manual processes.
2. The average time needed "after" indicate the time required in performing the application during the actual simulation test at UAT.
3. Input indicates the time needed by the employees to finish their tasks in the process.
4. Output indicates the time needed by the employees to obtain the result of the input.

²⁰ This is the result of averaging the sub-categories of E-Office modules, Document Management modules, ISO modules, and K3 modules.

From the above table, it is apparent that the new corporate portal is able to reduce the “work-in-process” and reduce the required time to complete certain tasks. The potential savings can be summarized as follows;

1. 2.16 days – 0.06 days = 2.1 days in performing input process, on average.
2. 4.98 days – 0.67 days = 4.31 days in potential waiting time for the output process, on average.
3. In total, employees can save a total time of 7.14 days – 0.73 days = 6.41 days per process, on average.

As a result, an average of 6.41 days saving can be used to perform other work processes. This saving also enables employees to work more efficiently, and maintain focus on assigned tasks.

In terms of productivity rate, the above table can also reveal the following estimates;

1. The condition “before” indicated an output of 4.98 days with a total input of 2.16 days. *Ceteris paribus*, this is translated into 2.31 productivity level.
2. The condition “after” indicated an output of 0.67 days with a total of input of a mere 0.06 days. *Ceteris paribus*, this is translated into 11.17 productivity level.

Thus, the corporate portals appear to support the increase productivity rate per person; from an index of 2.31 jumps to an index of 11.17. This leap signifies about 500%. This influences a much higher contribution rate per person to the organization, as well.

VIII.3. Costs and Benefits

VIII.3.1. Costs

The accumulated costs²¹ for the corporate portal project are approximately Rp. 405 million. This amount includes guarantee and free maintenance for the first year of operation. After the first year, maintenance charges are set at 20% of

²¹ The accumulated costs consist of cost of resources and physical costs. Cost of resources represent an estimated of 1 (one) project manager and 12 (twelve) people with various responsibilities in developing the corporate portal project. This is estimated to be Rp. 276 million. Physical costs represent the organization’s potential investment in hardware to develop the organization’s corporate portal. Estimated price on software is not included in the estimated pricing of about Rp. 129 million, since PT. XYZ has a corporate agreement to legally use all available software by Microsoft.

the initial cost of developing such a portal. This is amounted to Rp. 81 million per year.

VIII.3.2. Benefits

A corporate portal has lots of benefits. It is crucial for the users to understand the advantages of using a corporate portal. Users who are aware of the essence of a corporate portal would potentially save time in handling various tasks. This translates into a much better use of the organization's resources, and improving contribution of each employee. At the end, organizational productivity might improve as well.

In order to evaluate the benefits of the corporate portal, questionnaires were previously distributed using a Likert 5-scale; where "1" represents "strongly disagree", and "5" represents "strongly agree". The following lists are summary of the respondent's responses on various statements concerning potential benefits of a corporate portal (Kosasih, 2008);

1. Approximately 53% (fifty-three percent) of respondents strongly agree that a corporate portal improves information and knowledge sharing among employees within an organization. A corporate portal with all its applications has the high potential to assist employees in multiple locations. As it enhances the collaboration among employees, a corporate portal might improve information and knowledge sharing across the entire organization. Respondents appeared to have a clear grasp of this potential benefit.
2. Approximately 82% (eighty-two percent) of respondents were relatively in agreement that a corporate portal could potentially improve the organizational process flow. Through the use of E-office applications, document management, ISO and K3 applications, processes should improve since the standardized workflow systems are built-in in the corporate portal.
3. Approximately 80% (eighty percent) of respondents were in agreement that the establishment and use of a corporate portal could potentially improve the organization's competitiveness within the mining industry, not only in Indonesia, but also in the international marketplaces. Hence, the establishment and use of a corporate portal could also potentially boost the organization's international standard.
4. Approximately 77% (seventy-seven percent) of respondents agree that the establishment and use of a corporate portal could potentially reduce

operational costs. Such costs are mainly printing, distribution, communication, and travel expenses, perhaps. Based on the information gathered from the Department of Information Technology of PT. XYZ, the approximate prices for paper, and ink, are Rp. 100/page, and Rp. 1,200/page, respectively. Thus, the total cost of printing is about Rp. 1,300/page²². Nonetheless, using an assumption that this cost is actually 50% discounted by suppliers, due to bulk routine purchases of papers and ink by PT. XYZ, the total cost of printing becomes a mere Rp. 650/page. Taking an approximation of only 250 employees, who are routinely engaged in some types of printing every day, and each employee makes an average of 10-page print-outs per day, the potential savings are Rp. 1.625 million/day²³. This is equivalent to Rp. 32.5 million/month²⁴, or Rp. 390 million/year.

5. Approximately 84% (eighty-four percent) or respondents agree that the establishment and use of a corporate portal can potentially increase employees' productivity. Previous calculations on predicted productivity level seem to support the respondents' opinion. The estimated employees' productivity jumps from 2.31 to 11.17, which is equivalent to about 6 extra days to perform some other tasks; 2 days of saving on input, and 4 days of saving on output waiting. PT. XYZ reveals the following calculations to note the monthly cost-savings on productivity;

$$CS = \frac{\text{inputsavings} * \text{frequency} * \text{averagesalary} * \text{totaluser} * 20\%}{\text{workinghourspermonth}}$$

Using the previous data, the potential monthly cost-savings on productivity is;

$$CS = \frac{2 * 10 * 6,000,000 * 250 * 20\%}{160}$$

The monthly cost-savings on productivity is Rp. 37.5 million. In a year, the potential cost-savings on productivity becomes Rp. 450 million.

The above calculations on costs and benefits uncover a relatively favorable figure for PT. XYZ. The total cost of carrying out the corporate portal project of

²² This approximation is based on the use of HP Laser Jet 2840.

²³ The calculation is as follows; 10 pages * Rp. 650/page * 250 people = Rp. 1,625,000/day.

²⁴ This calculation assumes 20 working days in a month, and 1-shift of operational hours only.

Rp. 405 million appears rather minimal, as compared to the potential benefits from the establishment and use of a corporate portal of Rp. 840 million²⁵.

VIII.3.3. Payback Period

The payback period can be calculated using the following formula;

$$payback = \frac{\text{original investment}}{\text{monthly net cash flows}} = \frac{\text{investment}}{\text{potential savings}}$$

The overall investment is Rp. 405 million. The potential savings are Rp. 32.5 million from printing, and Rp. 37.5 million.

$$payback = \frac{450,000,000}{32,500,000 + 37,500,000} = \frac{450,000,000}{70,000,000}$$

This formula shows that the payback period is a mere 6.4 months for PT. XYZ.

VIII.3.4. ROI

ROI can be calculated using the combination of the following formulas;

$$NB = \frac{(TB - TC - \text{Depreciation})}{\text{Useful Life}} \text{ and } ROI = \frac{NB}{TIC}$$

where;

- TB = Rp. 390 million + Rp. 450 million = Rp. 840 million/year
- TC = maintenance after 1 year of installation of Rp. 81 million/year
- Depreciation is assumed to be straight-line. Hence, the total physical cost of Rp. 129 million is to be depreciated over 2 years²⁶, or equivalent to Rp. 64.5 million/year.

²⁵ This figure combines the potential savings on printing of Rp. 390 million/year, and an increase in employees' productivity of Rp. 450 million/year.

²⁶ The depreciation period of 2 years is used in this calculation to show the impact of significant changes and modification in technology, particularly in the hardware needs for PT. XYZ within the next 2 years following the completion of the corporate portal.

- Useful life of the corporate portal is assumed to be 3 years²⁷.

Using those figures above,

$$NB = \frac{(840,000,000 - 81,000,000 - 64,500,000)}{3}$$

The net benefit of this corporate portal project is Rp. 231.5 million. Using this figure of net benefit,

$$ROI = \frac{231,500,000}{405,000,000}$$

From this calculation, ROI reaches 57%. This simply means that for every Rp. 1 invested in the corporate portal project, the potential return is Rp. 0.57, or simply 57 cents.

VIII.3.5. ROCE

ROCE can be calculated using the following formula;

$$ROCE = \frac{EBIT}{(TA - CL)}$$

Figures from PT. XYZ financial statement have been collected, as shown in the table below;

²⁷ The useful life of 3 years is used to reflect the short-term requirements of upgrading, modification, and other changes into the corporate portal due to the amount of data, information, and/or process flow in PT. XYZ.

Table 6: Figures from Financial Statements		
	2006 (in Rp)	2007 (in Rp)
EBIT	2,219,888,717	7,301,648,639
Total Assets	7,292,142,247	12,037,916,922
Current Liabilities	1,179,515,758	1,798,816,747
ROCE	36%	71%
Source: Kosasih, 2008		

From the above table, it shows that ROCE is almost doubled. This may indicate that the corporate portal, in fact, reveal a favorable condition for PT. XYZ since every Rp. 1 invested in the corporate portal, the potential returns is approximately 71 cents, in 2007. This trend is expected to continue for the upcoming year, undoubtedly.

IX. Conclusion

One main benefit of a corporate portal is certainly the applications, which may be helpful in improving information and knowledge sharing among employees. Knowledge contains the elements of information plus experience. Through experience, employees' knowledge can be broadened based on the support of information sharing in the corporate portal.

An additional benefit resulting from improved information and knowledge sharing is the increased productivity. Based on the case study of PT. XYZ, employees could possibly save, on the average, about 2 days on input per process, by using the corporate portal's various applications. Productivity increases as corporate information becomes more easily accessible to employees.

A corporate portal represents a place, where boundaries are relaxed, and information exchange is deemed encouraged. As employees become more experienced and skillful, employees' ability in making better and faster

decisions enhances. Thus, productivity within the company increases, and expenses can be substantially minimized.

X. Recommendations

Like any other software application, a corporate portal cannot produce the desired results until different issues related to such a corporate portal have been properly addressed. Considering the information gathered from informal interviews, questionnaires, observations, and research on PT. XYZ's corporate portal, the following recommendations, which are general in nature, and in most cases can be applied to other corporate portals, are suggested.

X.1. Managerial Recommendations

X.1.1. Business Goals

Different companies have different business goals for implementing the portal. The management team should clearly define the business goals that the organization attempts to achieve via a corporate portal. Since the business goal of PT. XYZ for its corporate portal is to improve information and knowledge sharing among employees, it is essential to develop a strategy that is consistent with this set of business goals. If the issue of business goals were not properly addressed, it would be rather difficult to realize the desired results from the portal implementation.

X.1.2. Branding

If employees are not aware of the benefits offered by a portal, they are unable to take the full advantage of this facility. Branding the portal will help the employees to constantly aware of such an existence. The management team should try to create a culture that allow all members of the organization to know about the corporate portal; its features, services, and advantages. The corporate portal should be referred to in all reports and presentations, meetings, and during any discussions to continuously remind employees about its presence.

X.1.3. Usability and Benefits

Usability is another important factor for the success of any corporate portals. Many corporate websites and portals fail, only due to lack of this factor. Portal developers and designers have to be aware of user requirements, and needs to make the portal usable. Benefits are very much dependent on the organizational goals. The management team should constantly inform employees about the benefits of this corporate portal, until they start realizing the full benefits and usability from the firm's corporate portal.

X.1.4. Leadership

A corporate portal becomes valueless, and cannot achieve the desired results, unless the management is strongly committed. The management team should act as a role model and support the portal well enough to allow every employee to familiarize themselves with the corporate portal, including the variety of tasks, which can be done easily through it.

X.2. Technical Recommendations

X.2.1. Developer

In choosing a developer to set up a corporate portal, it is highly advisable to select the one, who already has experience in building a corporate portal. It is essential to make sure that the developer is also committed to this type of assignment. It is also important to note that both internal and external project teams can work well together in making this portal successful.

X.2.2. Characteristics

Successfulness of any corporate portal lies on its characteristics. Such characteristics should closely adhere to the requirements of potential users. It is deemed necessary to note that the most important feature in any corporate portals are ease of use. The chances that employees would use such a corporate portal rely on the relevancy of its content, and simplicity in finding information. Otherwise, employees would perceive the corporate portal useless.

X.2.3. Improvement

A corporate portal must be updated, modified, or otherwise improved periodically, to keep pace with users' needs and requirements. It is important to provide the updated content, while removing irrelevant, or otherwise outdated information.

X.3. Social Recommendations

X.3.1. User Requirement and Needs

Addressing the user requirements and needs in developing a corporate portal has been proven beneficial in achieving the desired results. User needs should be addressed early in the beginning phase of the project. As the project progresses, requests and changes from users should be well accommodated.

X.3.2. Motivation

Employees should be encouraged to take advantage of the portal. It is the responsibility of top management to create a formal policy for using the available applications to minimize the manual process.

X.3.3. Trust and Satisfaction

A crucial success factor is the users' trust in the corporate portal. Similarly, users' satisfaction level in the corporate portal is just as critical. Both trust and satisfaction could be achieved only when users are convinced that they are able to find information they are looking for. In addition, the information available on the portal has to be accurate, complete, and up-to-date. If users encounter difficulties when looking for information, it becomes rather impossible to establish a sharing culture among all employees.

X.3.4. Cultural Transformation

The critical success of a corporate portal is also dependent on the employees' ability to adapt to a new culture. Using a corporate portal may mean that

employees need to “get wet” with a computer-based applications, which is supposed to replace any paper-based documents.

X.4. Potential Negative Impact

X.4.1. Dependence on IT Equipment

Work processes could be deeply affected and slowed down by power supply failures, server breakdowns, computer viruses, and other technical problems. These have been frequently occurring in Indonesia, and have proven to have substantial impact on organizational computer systems.

X.4.2. Dependence on Portal Developer/Vendor

The buyer of a corporate portal may automatically create high dependency on the services of the portal developer. Whenever technical problems arise, an organization may not have choices, but to consult with the portal developer.

X.5. Recommendations For PT. XYZ

Employees should be advised on how to use the corporate portal. Employees should be well-guided on the management of various applications in the corporate portal. Likewise, the management team should consider stakeholders, who may choose to access the corporate portal. In order to prevent improper use of the corporate portal, PT. XYZ has to establish distinct regulations on the usage of the corporate portal, including possible sanctions. This is imperative to minimize the probable negligence, or impediments at any future dates.

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Analisis Pemodelan Sistem Informasi Telkom Speedy Menggunakan Zachman Framework

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Abstract

Every institution or organization (especially government-owned institution) nowadays tends to increase its organizational ability in providing optimum service to all customers. PT.Telekomunikasi Indonesia Tbk is one of the large Information Communication Company. It provides services and communication networking with full service and network in Indonesia. One of the success product is Telkom Speedy, it serves the internet access end to end using ADSL (Asymmetric Digital Subscriber Line) technology.

This paper discusses the enterprise architecture model design using Zachman framework which can be applied to provide basic organizational structure that support access, integration, interpretation, development, management, and the shift of architectural equipment from organization information system. The abstract consists of Data, Function, Network, People, Time and Motivation. In this paper the model designing was only done to 12 cells consisting the perspectives of Planners, Owners, and Designers. The user of Zachman Framework is free to choose tools used to implement models to make. One of the tools is UML (Unified Modeling Language), UML is language of standard for explain and implementation from process analyzing and object oriented design.

The end result of enterprise architecture modeling design is hoped to be able to maximize and utilize all the organizations resources (PT Telekomunikasi Indonesia, Tbk for Telkom Speedy) in order to support the activities of business enterprise which give optimal service to all customers.

Keyword : Information System Modeling, Zachman Framework, Unified Modeling Language(UML).

1. Pendahuluan

Berkembangnya penggunaan internet saat ini memotivasi Telkom Speedy untuk mengembangkan wilayah pemasaran dan layanan terhadap pelanggan, banyak hal yang perlu dilakukan untuk mendukung hal tersebut, salah satu adalah kesempatan untuk memodelkan sistem informasi Telkom Speedy yaitu

suatu model yang dapat dijadikan sebagai landasan untuk mengimplementasikan teknologi dan Sistem Informasi.

Zachman Framework merupakan sebuah framework yang digunakan untuk memodelkan Enterprise Architecture, memodelkan secara detail dan menyeluruh hal – hal penting yang menjadi dasar dari sebuah perusahaan, Zachman menyajikan analisa tersebut melalui ke enam kolom dan baris yang dimiliki nya, dalam hal ini Telkom Speedy merupakan organisasi yang besar yang memiliki wilayah pemasaran produk sangat luas, dengan demikian Zachman Framework dapat menyajikan kebutuhan informasi perusahaan Telkom Speedy secara menyeluruh terhadap batasan tertentu.

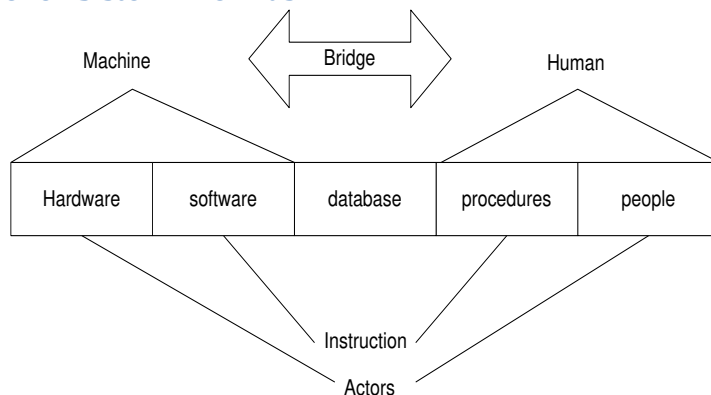
Berlangsung nya aktivitas organisasi dalam memperkenalkan Telkom Speedy hingga aktivitas mengusahakan memberikan layanan yang terbaik kepada konsumen nya menjadi suatu aliran aktivitas yang memuat input dan menghasilkan output yang diharapkan, keadaan ini yang akan di modelkan dalam pemodelan Sistem Informasi Telkom Speedy guna memberikan rekomendasi untuk keunggulan dan kekurangan produk tersebut.

2. Landasan Teori

2.1. Sistem Informasi

Sistem informasi adalah sutau sistem didalam suatu organisasi yang mempertemukan kebutuhan-kebutuhan pengolahan transaksi harian, mendukung operasi, bersifat manajerial dan kegiatan strategi dari suatu organisasi dan menyediakan pihak luar tertentu dengan laporan-laporan yang diperlukan.

2.2. Komponen Sistem Informasi



Gambar 2.1 Lima Komponen dalam Sistem Informasi

2.3. Analisis dan Perancangan Berorientasi Object

Coad & Yourdon menyatakan 7 motivasi kunci dan keuntungan analisis & perancangan berorientasi objek dibandingkan metode analisis tradisional:

- Menangani domain persoalan yang makin menantang
- Meningkatkan interaksi antara analis and ahli pada domain persoalan
- Secara eksplisit menyatakan kesamaan antara kelas & objek
- Membuat spesifikasi yang lebih tangguh terhadap perubahan
- Mengguna-ulang hasil OOA, OOD dan OOP Menyediakan representasi yang konsisten antara analisis, perancangan dan pemrograman

2.4. Arsitektur Sistem Client Server

Arsitektur ini diterapkan pada sebuah sistem jaringan. Sistem ini terdiri atas dua komponen (mesin) utama, yaitu client dan server. Client berisi aplikasi basis data dan Server berisi DBMS dan basis data.

2.5. Zachman Framework

Zachman Framework digunakan sejak 1987, penggunaan nya fokus terhadap sebuah Enterprise Architecture. Zachman memiliki 6 area (kolom) untuk memodelkan yaitu who, what, why, when, where, how dan Roles yang terdiri dari Planner(scope), owner(Enterprise model), Designer(InformationSystem), Builder(Technology model), Subcontractor(Detailed Representations), System(Functioning System).

2.6. Rational Rose

Rational rose adalah kakas(tools) pemodelan visual untuk pengembangan system berbasis objek yang sangat handal.untuk digunakan sebagai bantuan bagi para pengembang dalam melakukan analisis dan perancangan sistem.

2.7. Analisa SWOT

Merumuskan strategi perusahaan dengan melihat keadaan yang ada baik dari internal maupun eksternal yang meliputi kekuatan, kelemahan, peluang dan ancaman.

3. Analisis dan Perancangan

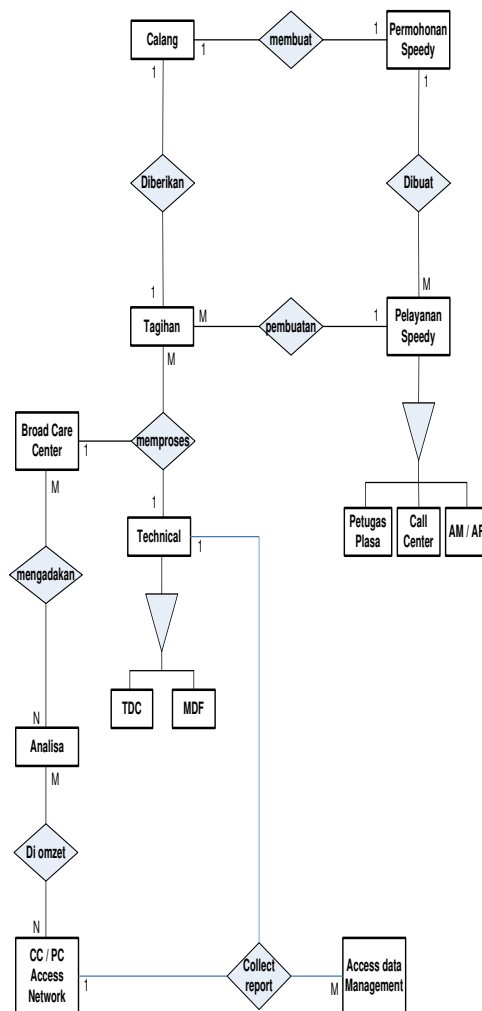
3.1. What

3.1.1. Objective / scope (Planner Perspective)

Pelaku bisnis yang menjadi scope untuk entitas bisnis TELKOM Speedy adalah sebagai berikut :

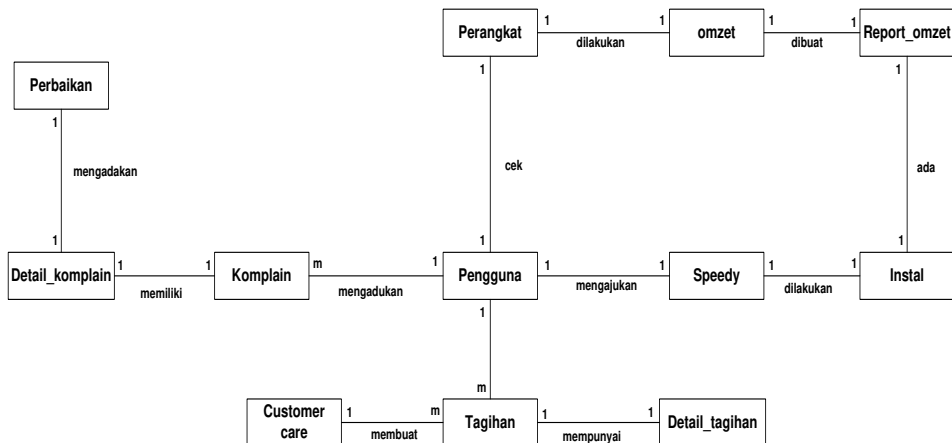
1. Calang(Calon Pelanggan)
2. Petugas Plasa
3. Call center
4. AM(Account Manager)
5. AR(Account Representatif)
6. Broadband Care Center
7. MDF(Main Distribution Frame)
8. TDC(Testing Dispatching and Clearance)
9. Access data management
10. CC/PC Access Network

3.1.2. Model of Business (Owner Perspective)



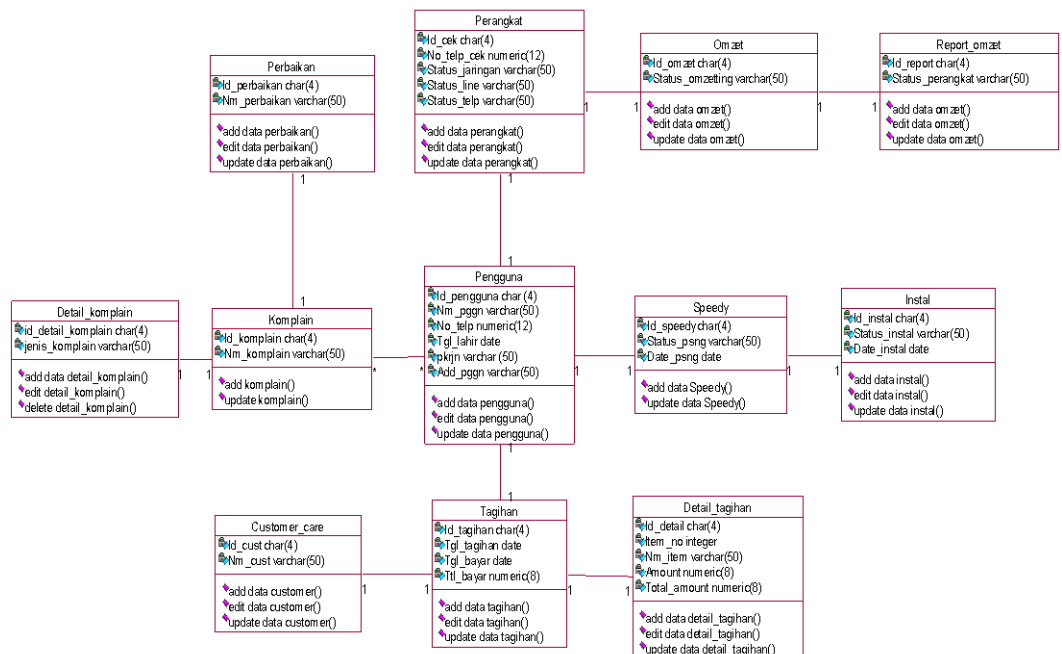
Gambar 3.1 Entitas Business Relationship

3.1.3. System Model (Designer Perspective)



Gambar 3.2 Domain Diagram

3.1.4. Technology Model(Physical) - Builder



Gambar 3.3 Class Diagram

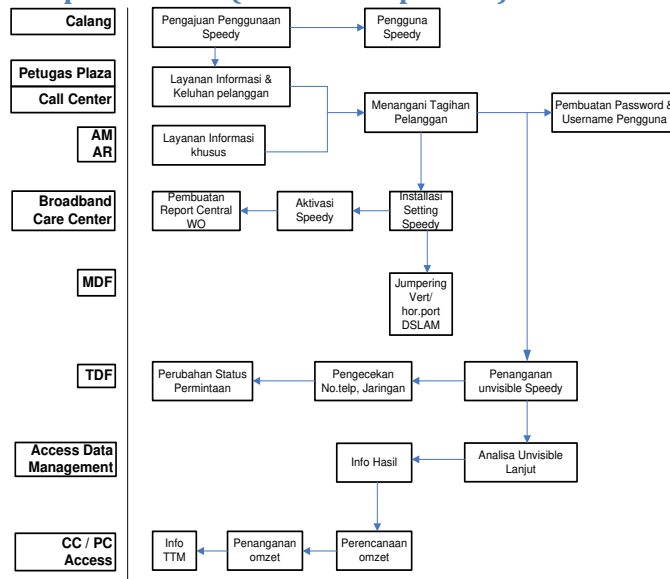
3.2. How

3.2.1. Scope (Planner Perspective)

Gambaran Proses Bisnis Layanan TELKOM SPEEDY adalah sebagai berikut :

1. Calang(Calon Pelanggan) mengajukan PSB(Pasang Baru) Speedy perlu line baru via :
 - Walk-in Plasa
 - Call- center 147
 - Web
 - Surat
 - Email
2. Permintaan PSB(Pasang Baru) telepon untuk Speedy, proses tetap dengan CPROD : TLP di registrasi di SISKI menggunakan NCLI Tlp Eksisting.
3. Melakukan proses Study Teknik
4. Petugas plotting/TDC mencek daftar permintaan PSB telepon untuk Speedy untuk dicarikan jaringan yang sesuai spesifikasi Speedy.
5. Jika ditemukan jaringan yang sesuai, status diubah menjadi FEAsible.
6. Menerbitkan SPB (info biaya PSB + IKR) ke calang.
7. Pembayaran dilakukan kemudian permintaan diaktivasi.
8. Kelengkapan Administrasi
9. Secara paralel, WO mengalir ke :
10. I-WO ke Jarlok untuk diteruskan ke instalasi
11. M-WO ke MDF, ptgs MDF menjumper Horz/Vert primer jaringan terkait.
12. L-WO diterima Jarlok, didispatch ke Regu terkait (PCAN/CCAN) sesuai
13. S-WO diterima oleh TDC untuk aktivasi I/C only via TLWS
14. Setelah seluruh RWO dikirim, TDC kontak pelanggan untuk : info kring telepon dan buka O/G via TLWS.
15. TDC lakukan Put Into Service(PS), permintaan KRING
16. Dalam hal Line yang didapat tidak sesuai spek speedy, maka :
17. Petugas survey Advakab/Catel, melakukan survey untuk mencari line terdekat yang sesuai spek Speedy
18. Jika ditemukan line pelanggan terdekat yang sesuai spek Speedy, dateknya di infokan kepada Jarlok untuk dilakukan omzet fisik. Petugas Jarlok melakukan omzetting fisik jaringan sesuai: info advakab
19. Data teknis hasil omzeting Line telepon terkait dilaporkan via Winhouse untuk selanjutnya dicek dan bila sesuai langsung dieksekusi
20. Koreksi data teknis sesuai hasil omzeting oleh petugas Entry Advakab.
21. Data permintaan telepon/Speedy teknik tidak mungkin sebagai inputan data perencanaan
22. Pemenuhan data permintaan, antara lain berupa: Benjar, Rehap, JT, Pensysteman, dimana datek nya di inputkan via WinHouse.

3.2.2. Enterprise Model (Owner Perspective)



Gambar 3.4 Flow Process

3.2.3. System Model (Designer Perspective)

3.2.3.1. Definisi Actor

No	Actor	Deskripsi
1.	AM / AR	Actor yang bertanggungjawab terhadap pelayanan informasi khusus kepada calon pelanggan
2.	Access Maintenance	Actor yang bertanggungjawab terhadap pemeliharaan sistem yang digunakan pengguna Speedy.
3.	Broadband Care center	Actor yang bertanggungjawab untuk instalasi speedy dan pembuatan report work order(wo)
4.	Calang(Calon Pelanggan)	Actor yang memberikan data kepada calang untuk pemasangan Speedy.

5.	CC / PC Access	Actor yang bertanggungjawab menangani kerusakan jaringan dengan melakukan omzetting.
6.	MDF	Actor yang bertanggungjawab melakukan jumpering vert/hor.port DSLAM
7.	TDF	Actor yang bertanggungjawab menangani unvisible speedy, pengecekan perangkat dan perubahan status permintaan.

3.2.3.2. Definisi Usecase

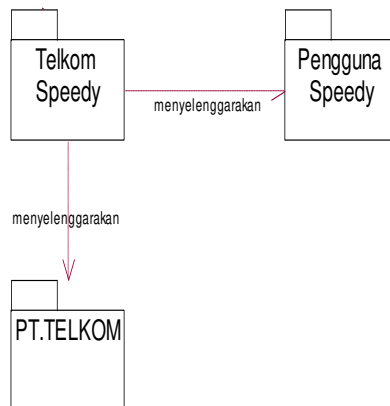
No.	Usecase	Deskripsi
1.	Analisa unvisible	Merupakan proses analisa terhadap kegagalan perangkat untuk pemasangan speedy
2.	Aktivasi Speedy	Merupakan proses pengaktifasian layanan speedy
3.	Cek perangkat	Merupakan proses pengecekan perangkat calon pengguna speedy sebelum dilakukan pemasangan speedy
4.	Info hasil	Merupakan proses membuat keputusan sebagai hasil dari analisa kegagalan perangkat
5.	Info TTM(Tehnik tidak mungkin)	Merupakan proses membuat keputusan sebagai hasil dari penanganan omzet
6.	Instalasi Speedy	Merupakan proses penginstalan speedy
7.	Jumpering vert/hor.port DSLAM	Merupakan proses pemasangan port, jumpering,dsb.
8.	Keluhan dan complain pelanggan	Merupakan proses memberikan keluhan dan komplain dari perangkat maupun sistem yang telah di instalasi.
9.	Layanan informasi	Merupakan proses memberikan layanan untuk

	dan keluhan	menampung keluhan dari pengguna speedy untuk ditindaklanjuti.
10.	Layanan informasi khusus	Merupakan proses memberikan layanan informasi mengenai layanan Telkom Speedy dan menampung keluhan secara khusus untuk pengguna tertentu untuk ditindaklanjuti.
11.	Pengajuan psg Speedy	Merupakan proses pengajuan pemasangan speedy oleh calon pengguna
12.	Pembayaran tagihan	Merupakan proses pembayaran tagihan dari seluruh layanan yang diterima oleh pelanggan baik khusus maupun rutin
13.	Pencetakan tagihan	Merupakan proses pencetakan tagihan pelanggan yang akan diberikan kepada pelanggan
14.	Pembuatan password dan username	Merupakan proses pembuatan password dan username pengguna yang akan digunakan ketika speedy telah aktif.
15.	Perubahan status permintaan	Merupakan proses memberikan keputusan terhadap status permintaan speedy yang sebelumnya mengalami kegagalan perangkat untuk pemasangan speedy
16.	Penanganan unvisible Speedy	Merupakan proses penanganan kegagalan perangkat untuk pemasangan speedy.
17.	Penanganan omzet	Merupakan proses pengalihan jaringan pada perangkat yang mengalami kegagalan ataupun kerusakan
18.	Perencanaan omzet	Merupakan proses perencanaan pengalihan jaringan pada perangkat.
19.	Report central wo	Merupakan prose pembuatan laporan work order untuk pemasangan, instalasi, perbaikan maupun pengalihan jaringan.

20.	Setting Speedy	Merupakan proses pengaturan pada sistem speedy.
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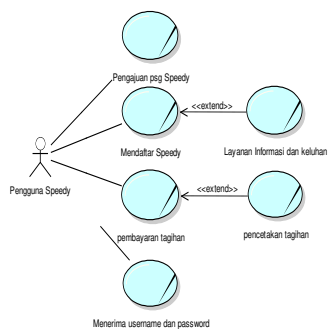
3.2.3.3. Usecase Diagram

1. Diagram Paket Usecase



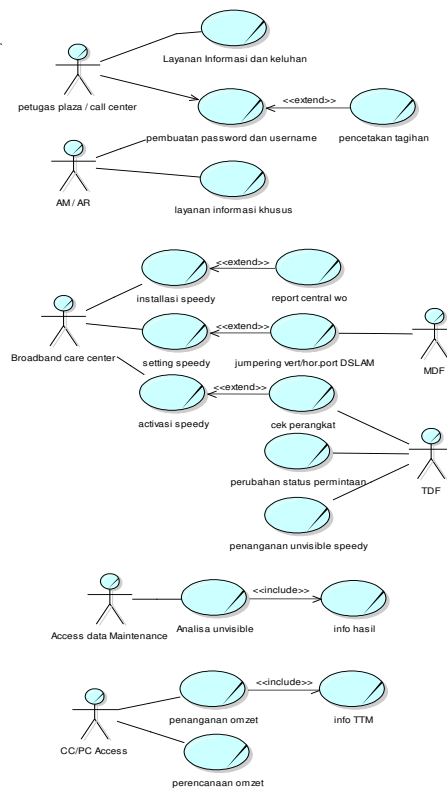
Gambar 3.5 Diagram paket usecase

2. Paket Usecase Pengguna Speedy



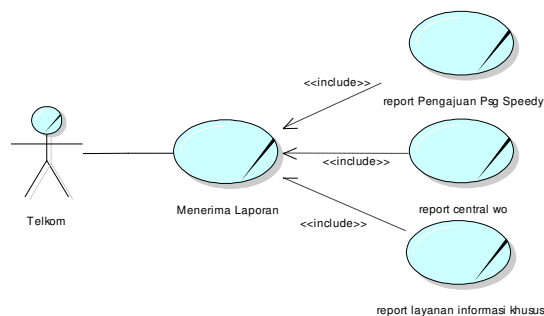
Gambar 3.6 Paket Usecase pengguna Speedy

3. Paket Usecase Speedy



Gambar 3.7 Paket usecase Speedy

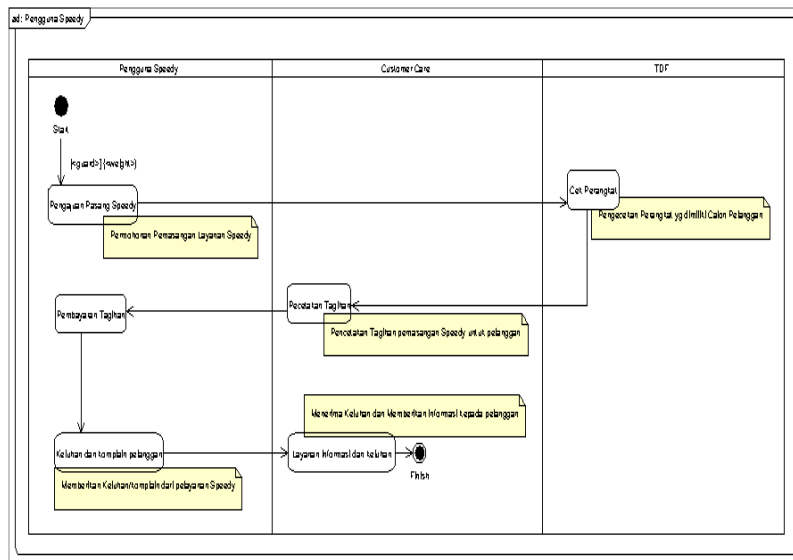
4. Paket Usecase PT.Telkom



Gambar 3.8 Paket usecase PT.Telkom

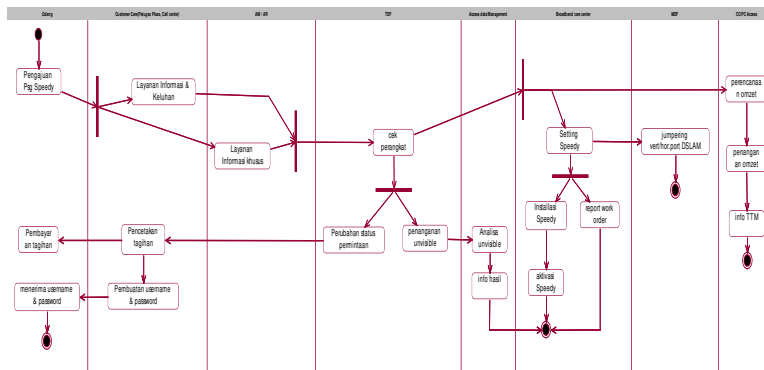
3.2.4. Technology Model(Physical) – Builder

3.2.4.1. Activity Diagram Paket Pengguna Speedy



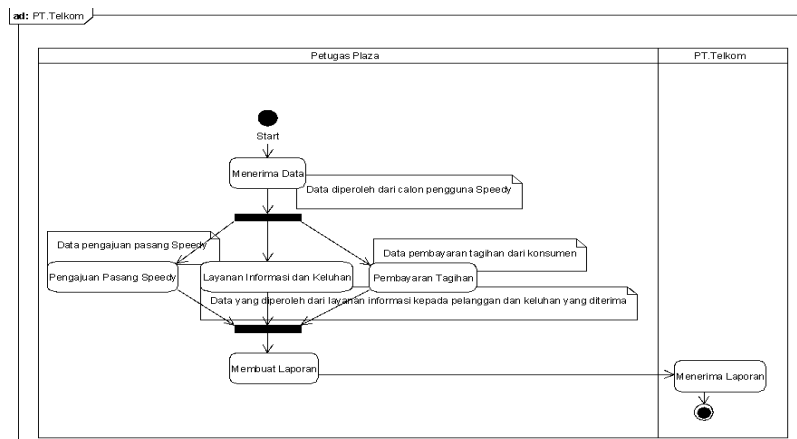
Gambar 3.9 Activity Diagram Paket Pengguna Speedy

3.2.4.2. Activity Diagram Paket Speedy



Gambar 3.10 Activity Diagram Paket Speedy

3.2.4.3. Activity Diagram Paket PT.Telkom



Gambar 3.11 Activity Diagram Paket PT.Telkom

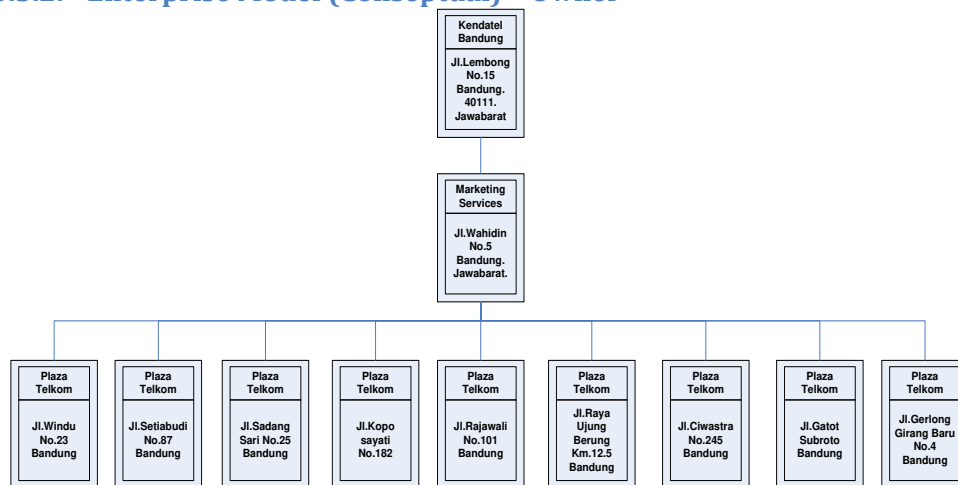
3.3. Where

3.3.1. Objective/Scope (Planner Perspective)

Speedy memiliki beberapa bagian yang terpisah yang menangani divisi tertentu :

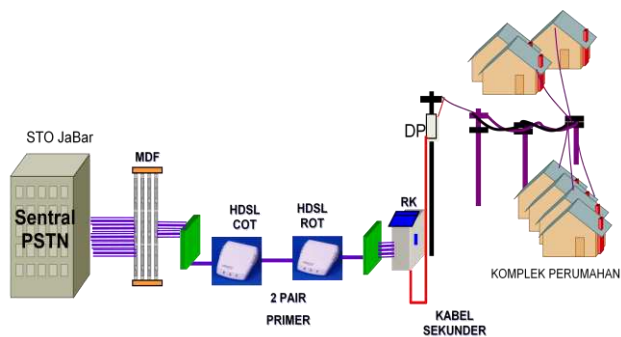
1. Bagian Marketing
Alamat : Jl.Wahidin no.5 Bandung
2. Bagian Technical (Access N/W Operational & Access N/W Operation)
Alamat : Jl.Lembong No.15 Bandung, 40111, Jawa Barat – Indonesia.

3.3.2. Enterprise Model (Conceptual) – Owner



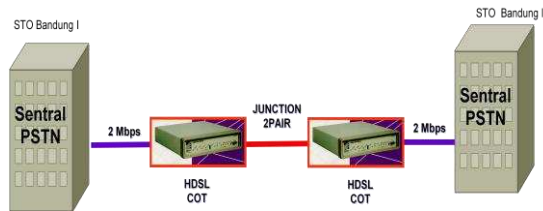
Gambar 3.12 Logistic Network Telkom Speedy

3.3.3. System Model (Designer Perspective)



Gambar 3.13 Struktur jaringan Telkom Speedy secara umum

3.3.4. Teknologi Model (Builder Perspective)



Gambar 3.16 Struktur Jaringan Speedy

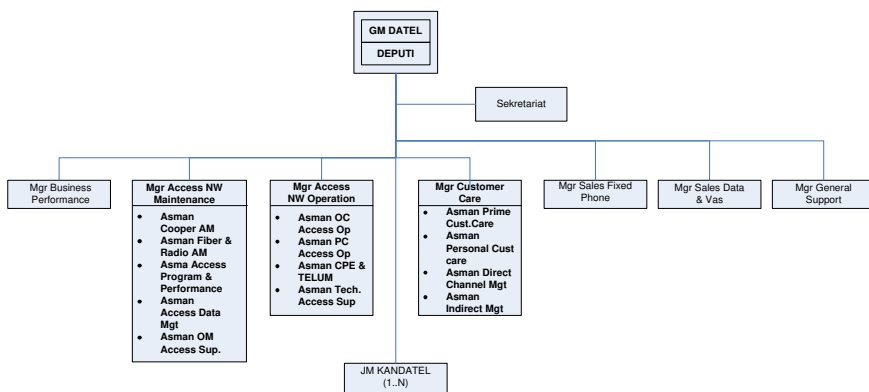
3.4. Who

3.4.1. Scope (Planner Perspective)

Daftar dari komponen Organisasi Telkom Kandatel Bandung yang terkait dengan layanan Telkom Speedy:

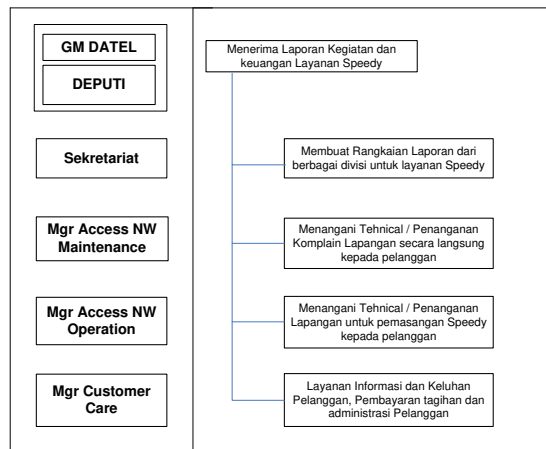
1. GM Datel / Deputi
2. Sekretariat
3. Manager Access Network Maintenance
4. Manager Access Network Operation
5. Manager Customer Care

3.4.2. Enterprise Model (Owner Perspective)



Gambar 3.17 Struktur Organisasi TELKOM Kandatel Bandung

3.4.3. System Model (Designer Perspective)



Gambar 3.17 Struktur Organisasi TELKOM Kandatel Bandung

3.4.4. Teknologi Model (Builder Perspective)

Merupakan deskripsi dari struktur organisasi mengenai tugas, wewenang, tanggung jawab dan spesifikasi pendidikan yang tepat untuk menempati suatu divisi pada PT.Telkom yang menangani Telkom Speedy.

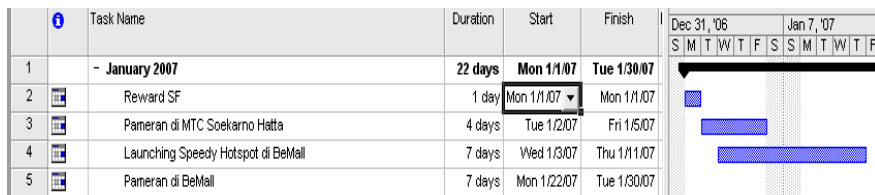
3.5. When

3.5.1. Scope (Planner Perspective)

PT.Telkom memiliki strategi pasar yang luas dan berkualitas untuk masing-masing produk unggulan nya. Berikut ini merupakan Jadwal / Kegiatan Layanan Telkom Speedy dalam satu periode kerja.

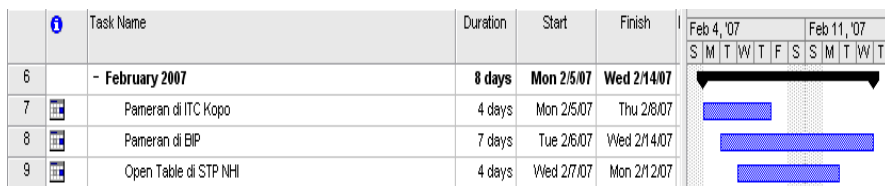
3.5.2. Enterprise Model (Owner Perspective)

- Event layanan Telkom Speedy untuk bulan : Januari 2007



Gambar 3.19 Event Layanan Telkom Speedy – Januari 2007

- Event layanan Telkom Speedy untuk bulan : Februari 2007



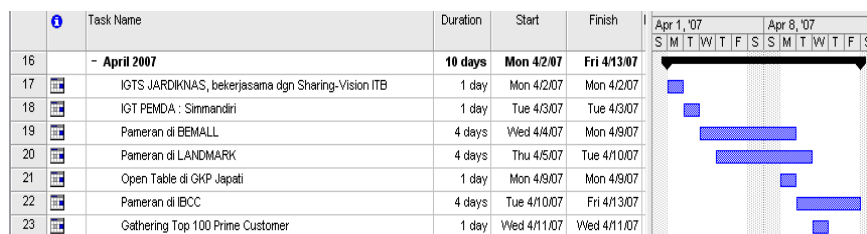
Gambar 3.20 Event Layanan Telkom Speedy – Februari 2007

- Event layanan Telkom Speedy untuk bulan : Maret 2007



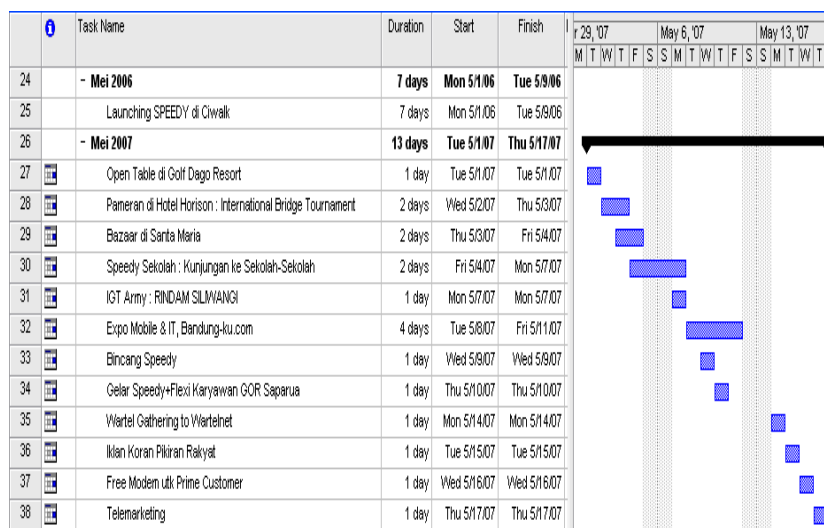
Gambar 3.21 Event Layanan Telkom Speedy – Maret 2007

- Event layanan Telkom Speedy untuk bulan : April 2007



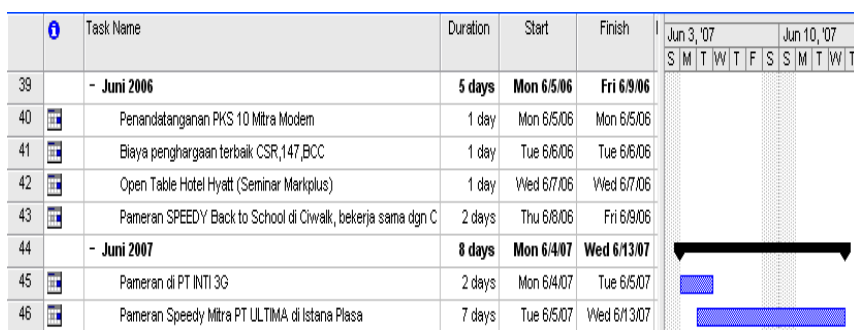
Gambar 3.22 Event Layanan Telkom Speedy – April 2007

- Event layanan Telkom Speedy untuk bulan : Mei 2006 / 2007



Gambar 3.23 Event Layanan Telkom Speedy – Mei 2006 / 2007

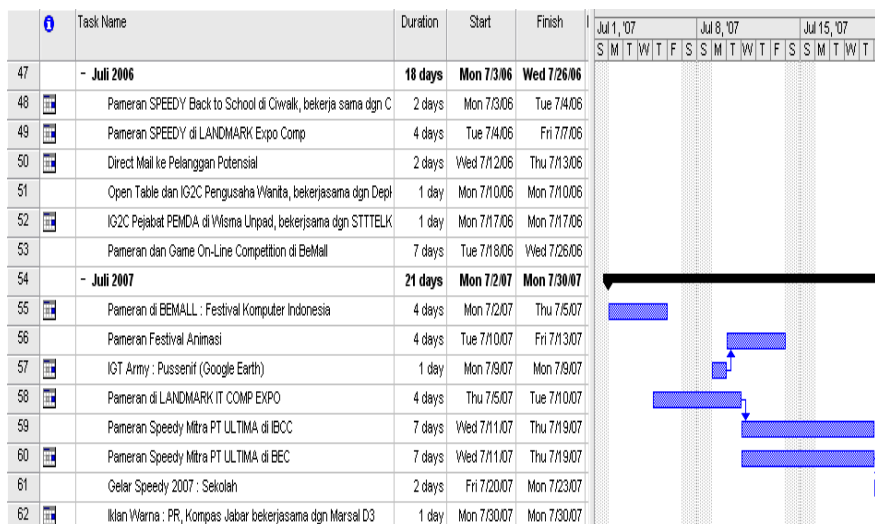
- Event layanan Telkom Speedy untuk bulan : Juni 2006/2007



Gambar 3.24 Event Layanan Telkom Speedy - Juni 2006/ 2007

- Event layanan Telkom Speedy untuk bulan : Juli 2006/2007

Analisis Pemodelan Sistem Informasi Telkom Speedy Menggunakan Zachman Framework
(Radiant Victor Imbar, Ria Handayani M.)



Gambar 3.25 Event Layanan Telkom Speedy – Juli 2006/2007

Berikut merupakan Visi dan Misi dari PT.TELKOM yang juga menjadi pedoman untuk layanan Telkom Speedy:

- Visi

To become a leading InfoCom player in the Region

Telkom berupaya untuk menempatkan diri sebagai perusahaan InfoCom terkemuka di kawasan Asia Tenggara, Asia dan berlanjut ke Asia Fasifik.

- Misi

Telkom mempunyai misi memberikan layanan " *One Stop InfoCom* " dengan jaminan bahwa pelanggan akan mendapatkan layanan terbaik, berupa kemudahan, produk dan jaringan berkualitas, dengan harga kompetitif.

Telkom akan mengelola bisnis melalui praktek-praktek terbaik dengan mengoptimalisasikan sumber daya manusia yang unggul, penggunaan teknologi yang kompetitif, serta membangun kemitraan yang saling menguntungkan dan saling mendukung secara sinergis.

4. Rekomendasi

4.1. Keunggulan

Berikut ini merupakan Keunggulan dari Sistem Informasi Telkom Speedy yang berjalan saat ini di PT.Telkom :

- Memiliki aktivitas pemasangan Telkom Speedy yang terintegrasi, sehingga meminimalisasi terjadinya kegagalan perangkat sehingga memberikan kepuasan kepada pelanggan (penjelasan lebih lanjut pada kolom Function(How)), diuraikan sbb :
 - Registrasi Permintaan PSB(Pasang Baru) telepon untuk Speedy, di lakukan di SISK(Aplikasi Telkom Speedy) menggunakan NCLI Telepon Eksisting(No yang diberikan ketika mendaftarkan layanan Telkom Speedy).
 - Melakukan proses Study Teknik, langkah berikut bertujuan memastikan keberadaan perangkat untuk disesuaikan dengan kebutuhan pemasangan Telkom Speedy.
 - Mencari jaringan yang sesuai spesifikasi Speedy, memastikan jika ditemukan kegagalan pada perangkat jaringan pelanggan.
 - Melakukan Instalasi, bertujuan untuk dapat mengakses layanan dan fitur Telkom Speedy
 - Melakukan survey untuk mencari line terdekat yang sesuai spek Speedy, jika pencarian jaringan gagal.

- Koreksi data teknis sesuai hasil omzeting, yaitu melakukan perbaikan atau mengganti jaringan yang baru.
- PT.Telkom menyajikan layanan yang melayani para pelanggan nya dengan banyak alternatif sehingga terjalin hubungan yang erat dalam memperoleh informasi dan menyampaikan keluhan (penjelasan lebih lanjut pada kolom Function (How)).
- Managemen Perusahaan yang berperan penting bagi PT.Telkom dalam melayani pelanggan nya berjalan dengan baik didukung diberlakukannya program peningkatan Sumberdaya Manusia (penjelasan lebih lanjut pada kolom Motivation (Why)).
- Pembayaran dapat dilakukan di Plaza Telkom, melalui website Telkom Speedy sehingga memudahkan pelanggan melakukan transaksi pembayaran (Gambar dapat dilihat pada kolom Network (Where)).
- Lokasi Plaza Telkom sangat strategis dan tersebar sehingga dapat dijangkau dengan mudah dari kawasan perkantoran dan rumah tangga (Gambar dapat dilihat pada kolom Network (Where)).
- PT.Telkom untuk layanan Telkom Speedy memiliki event layanan Speedy dengan menjangkau berbagai komunitas masyarakat dimulai dari pelajar, mahasiswa, rumah tangga, pusat perbelanjaan dan kantor pemerintahan, kegiatan tersebut berupa bazaar, pameran, maupun perlombaan. Pelaksanaan kegiatan ini diadakan hampir setiap minggu dalam satu periode kerja Telkom Speedy. Sehingga menjadikan Telkom Speedy sangat dikenal dan diminati oleh masyarakat (Time (When)).

4.2. Kekurangan

Berikut ini merupakan kekurangan dari Sistem Informasi Telkom Speedy yang berjalan saat ini di PT.Telkom :

- Sistem informasi Telkom Speedy belum memiliki dokumentasi yang mencatat aktivitas yang berlangsung, input dan output yang diterima.
- Managemen PT.Telkom akan merealisasikan program peningkatan mutu sumberdaya manusia pada periode kerja yang akan datang, dimana program tersebut disusun pada periode kerja yang sedang berjalan saat ini (Motivation (Why)).

5. Kesimpulan dan saran

Berdasarkan Analisis Pemodelan Sistem Informasi Telkom Speedy yang telah dilakukan maka dihasilkan dokumentasi untuk Telkom Speedy, dan berikut ini merupakan kesimpulan yang diperoleh :

1. PT.Telkom memiliki aktivitas pemasangan Telkom Speedy yang terintegrasi sehingga meminimalisasikan kegagalan perangkat pada pemasangan Telkom Speedy.
2. Pelayanan Telkom Speedy mudah dijangkau dan tersebar dengan menempatkan Plaza Telkom dilokasi yang strategis dan memiliki Website Telkom Speedy sehingga memungkinkan untuk mengakses layanan Telkom Speedy dimana saja.
3. Pelanggan Telkom Speedy dapat memperoleh informasi, membuat keluhan dan melakukan transaksi pembayaran melalui Plaza Telkom atau melalui Website Telkom Speedy.
4. PT.Telkom sedang merealisasikan program peningkatan mutu sumberdaya manusia untuk mensukseskan regenerasi sumberdaya manusia dimana pada periode sebelum nya hal ini belum menjadi perhatian pihak manajemen perusahaan.

Untuk meningkatkan pengetahuan mengenai Analisa dan Pemodelan sebuah Sistem Informasi seperti yang telah dibahas pada seluruh laporan ini maka saran yang diberikan adalah sebagai berikut :

1. Kiranya Laporan ini dapat dikembangkan untuk mendokumentasikan aktivitas dari seluruh layanan yang disediakan PT.Telkom sehingga perusahaan tersebut memiliki dokumentasi yang berguna untuk pengembangan perusahaan diwaktu yang akan datang.
2. Kiranya PT.Telkom memberikan perhatian terhadap regenerasi sumberdaya manusia yang telah dimiliki saat ini, dengan pelaksanaan program peningkatan mutu sumberdaya manusia yang bekerjasama dengan universitas dan perguruan tinggi.
3. Sebagai perusahaan besar yang telah memiliki kepercayaan besar dari masyarakat, PT.Telkom dapat memberikan keterbukaan untuk pengadaan analisis sehingga diwaktu yang akan datang PT.Telkom dapat memperoleh rekomendasi yang lebih baik, yang tentunya berguna mendukung peningkatan mutu perusahaan.

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Perancangan Sistem Pembayaran Uang Kuliah Berbasis Mobile Dengan Notifikasi Pembayaran Melalui SMS

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Abstract

The nowadays development of information technology make possible for different applications to communicate each others. One of the emerge technologies is Web Service. Web Service resolve as a software system designed to support interoperability interaction machine-to-machine through a network.

The main focus of this research is to build web mobile and Web Service applications that communicate each others that used in banking service using sample case of school payment in Universitas Negeri Sebelas Maret (UNS) Surakarta with using the service of Bank Central Asia (BCA). Beside that, it will be built an application using SMS technology to send notification payment transaction and PIN message to the student.

This application making will be supported by several technology such as Java, RMI, Struts, Web Service and others.

Keywords: *Web Service, Web Mobile, SMS, SMS Application, Java, RMI, Struts.*

1. Pendahuluan

Munculnya jaringan wireless dan mobile, merevolusi e-commerce menjadi m-commerce. M-commerce adalah salah satu jalan yang efektif dan nyaman bagi konsumen untuk melakukan transaksi elektronik dari mana saja dan kapan saja [1]. Sebagai salah satu contoh di Indonesia adalah mobilista-BCA (m-BCA) yang dikembangkan oleh Bank Central Asia (BCA) sebagai salah satu layanan internet bankingnya [2]. BCA menyediakan akses layanan transaksi online bukan hanya untuk pihak BCA sendiri melainkan pihak-pihak lain yang bekerjasama dengan BCA.

Fenomena m-commerce seperti ini dapat dimanfaatkan dalam dunia

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perkuliahan sebagai contohnya adalah pembayaran uang kuliah di Universitas Sebelas Maret Surakarta (UNS). Setelah membayar uang kuliah, mahasiswa akan menerima PIN untuk registrasi. Namun selama ini pembayaran uang kuliah yang dilakukan secara langsung melalui bank yang telah bekerja sama dengan UNS menyebabkan mahasiswa sering mengantri lama. Pembayaran secara transfer sendiri tidak dianjurkan oleh pihak UNS [3].

Dengan mengambil keuntungan dari m-commerce terutama m-payment, dapat dirancang sebuah aplikasi pembayaran uang kuliah yang mampu menangani masalah di atas. Sebagai sarana pembayaran transfer digunakan contoh kasus adalah BCA yang menyediakan sebuah aplikasi layanan transfer berupa Web Service yang dapat dimanfaatkan oleh pihak-pihak tertentu yang telah bekerja sama dengan BCA yang diberi ijin oleh BCA. Hasil dari perancangan ini adalah membangun sebuah sistem pembayaran yang terdiri dari sebuah aplikasi Web Service untuk layanan pembayaran dan tagihan yang terhubung dengan aplikasi Web Service bank dalam hal ini BCA, sebuah aplikasi SMS server untuk mengirim nomor referensi pembayaran dan PIN agar dapat disimpan mahasiswa dan sebuah aplikasi web mobile sebagai interface kepada mahasiswa UNS. Untuk aplikasi Web Service layanan transfer pembayaran BCA, digunakan sebuah aplikasi simulasi yang didasarkan pada aplikasi Web Service BCA yang telah ada.

2. Landasan Teori

M-commerce (mobile commerce) didefinisikan sebagai pertukaran atau penjualan dan pembelian barang, jasa dan informasi di Internet dengan memanfaatkan perangkat mobile [1]. M-commerce ini merupakan pengembangan dari keberadaan e-commerce (electronic commerce) yang telah ada sebelumnya.

Agar setiap perangkat mobile dapat mengakses dan berinteraksi dengan informasi dan layanan secara mudah diperlukan sebuah spesifikasi global terbuka yang disebut dengan Wireless Application Protocol (WAP) [4].

Sebuah aplikasi berbasis WAP, seperti aplikasi m-commerce, tampak oleh pengguna bekerja seperti aplikasi berbasis HTML. Karena WAP adalah protokol yang dikodekan secara biner, transaksi yang diterima oleh wireless device harus dikodekan. Berikut ini adalah urutan langkah yang terjadi ketika sebuah request diterima di WAP gateway dari wireless device dan mengirimkan response ke perangkat tersebut:

- WAP gateway menerjemahkan request ke HTML konvensional
- Gateway meneruskan request ke Internet
- Sebuah web server memproses URL
- Request akan diproses dan hasilnya akan dikembalikan dalam bentuk dokumen WML (Wireless Markup Language)
- Web server menambah HTTP header dan mengembalikan response ke WAP Gateway
- WAP Gateway mengkompilasi WML ke dalam bentuk biner yang diperlukan
- Gateway kemudian mengirim WML kembali ke mobile device
- Mobile wireless device menerima dokumen WML lewat protokol WAP
- Microbrowser pada wireless device memproses dokumen WML dan menampilkan dokumen, response dari server, pada layar

WAP tidak terlepas dari sebuah markup language yang dikenal dengan nama Wireless Markup Language (WML), yang memiliki kesamaan konsep dengan HyperText Markup Language (HTML) yang digunakan untuk mengembangkan halaman web [4]. WML menghasilkan sebuah dokumen eXtensible Markup Language (XML). Untuk membangun dokumen WML yang dapat digunakan untuk input-output user diperlukan struktur dan sintaks tertentu. Elemen utama dari setiap dokumen WML adalah header yang mengindikasikan versi XML yang digunakan dan XML Document Type Definition (DTD), sebuah deck yang diindikasikan dengan pasangan tag `<wml> ... </wml>` yang digunakan untuk menyatakan awal dan akhir dokumen WML sama seperti tag `<html> ... </html>` pada halaman HTML dan yang terakhir satu atau lebih card yang diindikasikan dengan pasangan tag `<card> ... </card>` yang menyatakan isi dari dokumen WML.

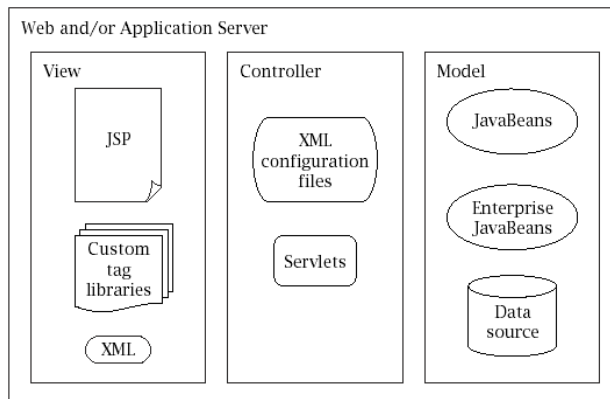
Seiring dengan perkembangan teknologi, muncul sebuah markup language baru yang disebut dengan eXtensible HyperText Markup Language (XHTML) yang merupakan turunan dari XML dan HTML. XHTML ini mampu digunakan untuk menciptakan dokumen WML yang dapat diakses lewat WAP dengan menggunakan bahasa HTML.

Sebuah aplikasi web yang diletakkan di server dapat terbagi menjadi tiga layer kode aplikasi: presentasi, bisnis objek dan data akses layer [5]. Presentasi atau yang sering dikenal dengan interface layer adalah layer yang berhubungan dengan user secara langsung. User atau klien akan berinteraksi lewat layer ini. Bisnis objek layer adalah layer yang berguna untuk memproses user request untuk diteruskan ke layer berikutnya dan data response dari server lewat data akses layer sebelum ditampilkan ke layer presentasi. Data akses layer adalah

layer kode yang berhubungan dengan akses langsung ke database. Pada layer ini data dari database diambil dan diberikan ke bisnis objek layer dan data dari bisnis objek dikirim ke database.

Dalam perkembangannya, untuk membangun sebuah aplikasi berbasis web, sering digunakan seperangkat aturan atau yang dikenal dengan framework yang digunakan untuk mempermudah penulisan kode-kode program sehingga pembuatan aplikasi menjadi lebih praktis. Salah satu framework yang sering digunakan oleh pengembang Java adalah Struts. Framework ini, menggunakan pengembangan aplikasi dengan pola Model-View-Controller (MVC). Pola MVC adalah sebuah cara untuk memecah sebuah aplikasi menjadi tiga bagian: model, view dan controller. Model digunakan untuk melakukan pemodelan bisnis aplikasi, bagaimana data dibawa dari user untuk diproses dan bagaimana data hasil proses dikembalikan kepada user. View digunakan untuk tampilan dan interaksi dengan user, sedangkan controller digunakan untuk mengatur laju aplikasi berdasarkan input yang dilakukan user dan proses hasil input dari user tersebut. Keuntungan dari MVC adalah tidak adanya logika bisnis atau pemrosesan di dalam layer presentasi atau view. Begitu juga sebaliknya, tidak ada logika presentasi dalam layer model maupun bisnis.

Inti dari teknologi Struts yang berbasis MVC adalah JavaServer Pages (JSP) dan Servlet [6]. Selain itu, Struts juga didukung dengan custom tags, XML dan web dan application server. JSP adalah teknologi yang digunakan untuk membangun aplikasi web yang melayani isi yang dinamik. JSP adalah komponen di sisi server yang dibangun dari HTML statik atau komponen XML, tag-tag yang spesifik untuk JSP, dan potongan kode Java optional yang disebut scriptlet. JSP digunakan sebagai layer presentasi dalam arsitektur web n-tier. Dalam framework Struts, JSP mewakili view dalam pola perancangan MVC.

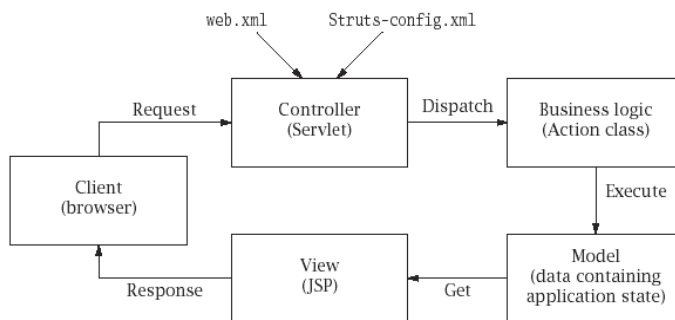


Gambar 1 Teknologi Struts

Servlet memegang peranan besar dalam pengembangan aplikasi web. Servlet adalah solusi berbasis Java yang berjalan di dalam Java Virtual Machine (JVM). Karena servlet berjalan di dalam JVM, servlet menjadi teknologi yang sangat portable. Paradigma request/response yang ada dalam HTTP juga diterapkan dalam servlet. Dalam arsitektur Struts, servlet memegang peranan sebagai controller.

JSP adalah teknologi yang berusaha tetap memisahkan layer presentasi dari lapisan tengah dan belakang. Custom tag libraries adalah fitur yang ampuh yang sesuai dengan konsep tersebut. Custom tag libraries memungkinkan programmer Java untuk menuliskan kode yang menyediakan akses data dan layanan lainnya dalam model sederhana mirip XML. XML sendiri digunakan untuk mewakili struktur dokumen dan data di web. Selain digunakan dalam menangani pertukaran data, XML sering digunakan dalam konfigurasi web dalam bentuk file web.xml dan digunakan dalam Struts untuk konfigurasi dalam bentuk struts-config.xml, yang digunakan untuk mengkonfigurasi semua aksi yang dapat dijalankan oleh aplikasi Struts.

Setiap aplikasi web tidak dapat lepas dari web server dan server aplikasi. Kedua server tersebut memegang peranan dalam setiap peluncuran aplikasi web. Sebuah web server menangani proses HTTP sementara web aplikasi menangani layanan lainnya. Tanpa kedua server tersebut, aplikasi web yang dibangun tidak dapat berjalan dan diakses dari pihak client.



Gambar 2 Model Aplikasi MVC dengan Struts

Dalam pengembangan aplikasi berbasis MVC, alur aplikasi ditengahi oleh controller. Controller bertugas untuk mendelegasikan request, dalam hal ini HTTP request ke sebuah handler yang tepat. Handler sendiri tidak lebih dari sekumpulan logika yang digunakan untuk memproses request. Dalam Struts, handler ini dikenal dengan nama action. Handler ini terikat dengan model dan setiap handler bertindak sebagai jembatan antara request dan model. Handler selanjutnya mengambil informasi yang diperlukan atas request dari layer bisnis kemudian memberikannya ke model. Model dalam Struts diimplementasikan dalam form-form yang dibentuk dari satu atau lebih JavaBean yang dikenal sebagai Action Form. Controller kemudian melanjutkan proses menuju view. Dalam Struts, controller dan model ditentukan menggunakan file konfigurasi berbasis XML yang disebut dengan struts-config.xml [5].

Web Service (WS) muncul seiring dengan perkembangan aplikasi berbasis client-server. WS diartikan sebagai sebuah sistem perangkat lunak yang dirancang untuk mendukung interoperabilitas interaksi mesin ke mesin lewat sebuah jaringan. Hal ini berarti bahwa WS dapat diakses lewat platform dan teknologi yang berbeda. WS memiliki sebuah interface yang dibangun dalam sebuah format yang dapat diproses oleh mesin, yang disebut dengan Web Service Description Language (WSDL). Sistem-sistem yang lain berinteraksi dengan WS melalui WSDL yang sudah ditetapkan sebelumnya menggunakan Simple Object Access Protocol (SOAP), yang biasanya dilangsungkan dengan menggunakan HTTP dengan sebuah serialisasi XML dalam penggabungan dengan standar web terkait lainnya.

Inti dari adanya WS adalah mengenai interoperabilitas [7]. Interoperabilitas ini berbicara bukan hanya interoperabilitas atas sebuah bahasa pemrograman yang sama, namun juga berbicara mengenai interoperabilitas antarbahasa pemrograman yang berbeda, antar-server dan platform yang berbeda pula,

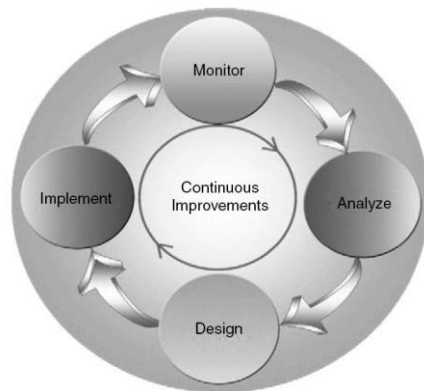
meliputi J2EE Server, .NET Framework, Perl, Apache Axis, Python, C++ dan sebagainya. Teknologi WS memungkinkan untuk berinteraksi dan bekerja sama dengan sistem yang berbeda, hal ini disebabkan karena WS adalah teknologi yang bebas platform, dengan kata lain, WS adalah media perantara yang digunakan untuk berkomunikasi yang tidak terbatas hanya pada bahasa pemrograman, sistem operasi dan hardware tertentu.

Inti dari interoperabilitas WS sendiri adalah Basic Profile (BP), yang dikeluarkan oleh Web Services Interoperability Organization (WS-I). BP menyediakan sekumpulan aturan yang mengatur bagaimana aplikasi-aplikasi menggunakan teknologi WS yang umum sehingga setiap aplikasi dapat berkomunikasi dengan bahasa yang sama. BP menyebabkan interoperabilitas WS dapat terlaksana.

Dalam dunia mobile, salah satu fitur yang menjadi layanan utama adalah Short Message Service (SMS). SMS memungkinkan pengguna untuk mengirim atau menerima pesan teks sampai dengan 160 karakter ke atau dari mobile phone. Keunggulan dari SMS adalah: jangkauan luas, biaya rendah dan mudah disimpan [4]. Keunggulan tersebut yang patut diperhitungkan dalam pengembangan aplikasi m-commerce.

3. Metodologi

Dalam melakukan perancangan sistem, metode yang digunakan adalah metodologi iterative yang diperbaiki terus menerus [8] dengan mengacu pada metode service oriented analysis and design (SOAD). SOAD adalah pendekatan untuk pemodelan dan pengembangan software yang secara khusus didesain untuk service-oriented architecture (SOA). Sedangkan SOA sendiri adalah sebuah gaya arsitektural yang menuntun penciptaan dan penggunaan proses bisnis sebagai sebuah layanan yang dapat didistribusikan melalui jaringan.



Gambar 3 Metodologi Iterative yang diperbaiki terus menerus

Adapun tahapan dalam metodologi iterative yang diperbaiki terus menerus meliputi requirement atau definisi kebutuhan sistem, analisis dari requirement yang didapat dengan memodelkan ke notasi UML, desain rancangan sistem, implementasi sistem dan monitoring sistem hasil implementasi.

4. Hasil Penelitian dan Pembahasan

Berdasarkan metodologi iterative yang digunakan, hasil penelitian yang diperoleh untuk tiap tahapan meliputi hasil requirement, hasil analisis dan desain, serta hasil implementasi.

Dari hasil tahapan requirement, sistem ini memerlukan sebuah layanan transaksi pembayaran oleh BCA, sebuah layanan pengambilan jumlah tagihan dan pembayaran uang kuliah UNS, layanan pengirim SMS notifikasi pembayaran dan PIN UNS dan sebuah aplikasi interface berbasis web mobile untuk pembayaran uang kuliah.

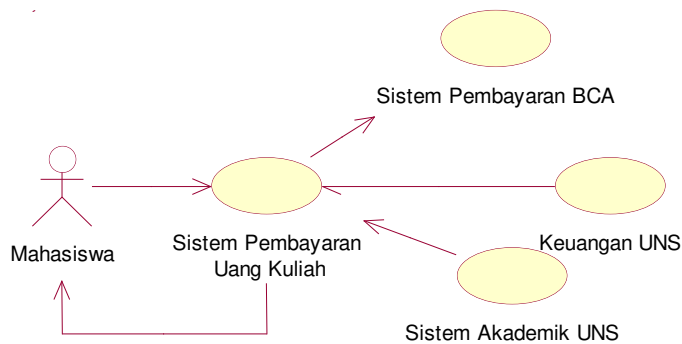
Perlu diketahui bahwa data tagihan mahasiswa UNS akan dihapus setiap semesternya dan untuk melakukan registrasi kuliah diperlukan PIN yang dihasilkan oleh pihak UNS.

Pada tahapan analisis dan desain, berdasarkan hasil requirement yang didapat maka gambaran umum sistem yang dibangun adalah sebagai berikut. Sistem akan terbagi menjadi lima buah aplikasi, yaitu aplikasi layanan pembayaran BCA, aplikasi layanan tagihan UNS, aplikasi layanan SMS, aplikasi simulasi token BCA, dan aplikasi web mobile client untuk interface pembayaran.

Aplikasi layanan pembayaran BCA diwujudkan dalam bentuk WS BCA yang

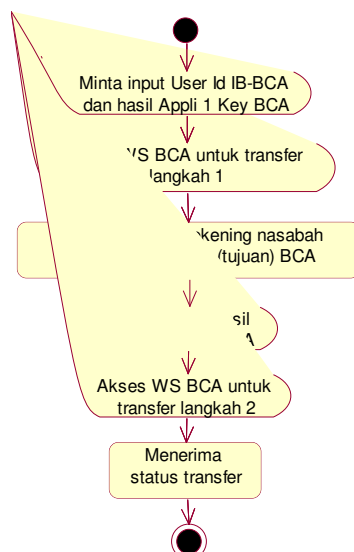
Keuangan UNS akan berhubungan dengan database UNS. Data keuangan di-update berdasarkan data pembayaran tagihan yang ada di database UNS.

Berdasarkan gambaran umum sistem tersebut mahasiswa akan berhubungan dengan sistem pembayaran uang kuliah. Sistem ini akan berhubungan dengan sistem-sistem yang lain, sehingga didapatkan diagram use case sebagai berikut.



Gambar 5 Diagram Use Case

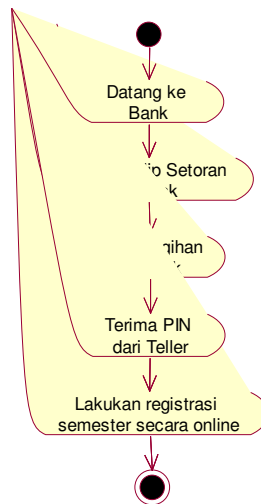
Dari hasil *requirement*, sejumlah diagram aktivitas diperoleh sebagai berikut.



Gambar 6 Diagram Aktivitas Pembayaran Menggunakan Web Service BCA

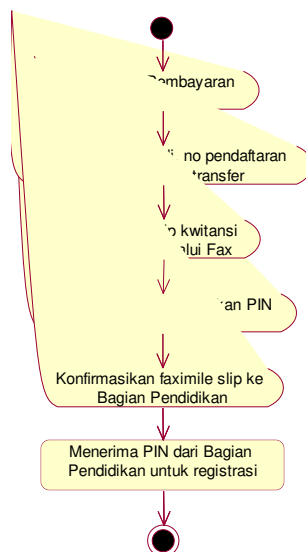
Pembayaran dengan menggunakan WS BCA berlangsung dengan urutan login IB-BCA (transfer langkah 1) oleh user menggunakan User Id IB-BCA dan hasil

Appli 1 Key BCA diikuti dengan proses transfer (transfer langkah 2).



Gambar 7 Diagram Aktivitas Pembayaran Langsung UNS

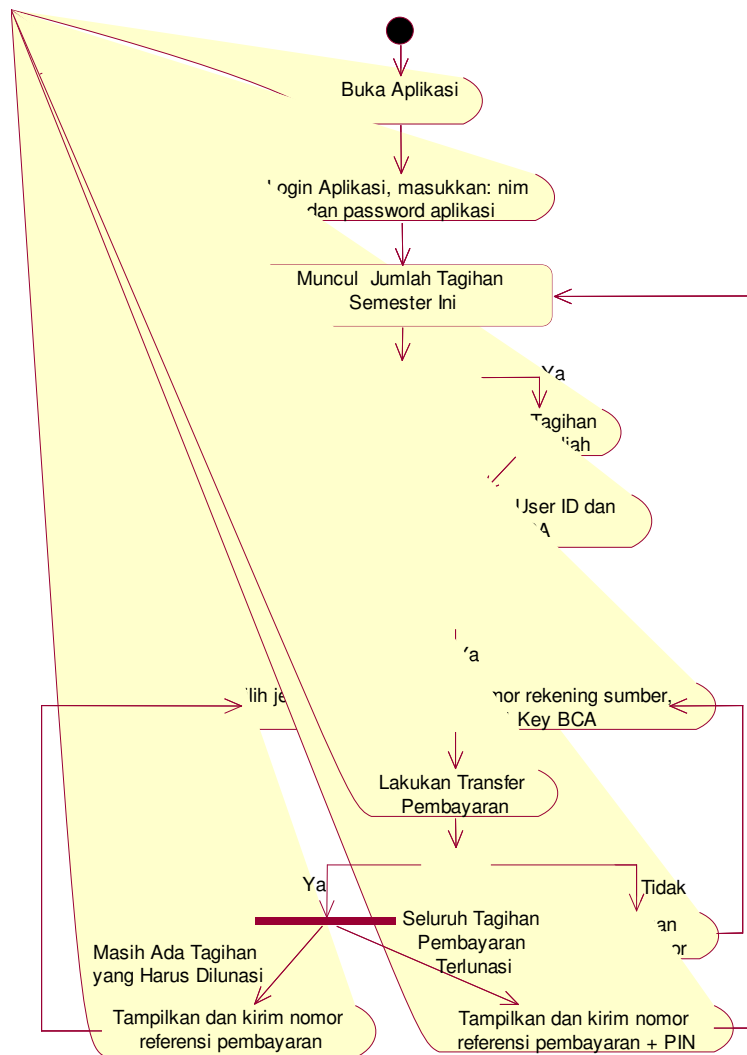
Pembayaran langsung UNS dilakukan di bank yang telah bekerja sama dengan UNS oleh mahasiswa UNS. Dengan mengisi slip setoran dan membayar di bank tersebut, mahasiswa akan mendapatkan PIN untuk registrasi kuliahnya.



Gambar 8 Diagram Aktivitas Pembayaran Transfer UNS

Pembayaran transfer UNS dilakukan dengan mengisi NIM, nama, program studi dan nomor pendaftaran pada berita slip transfer, kemudian kuitansi transfer

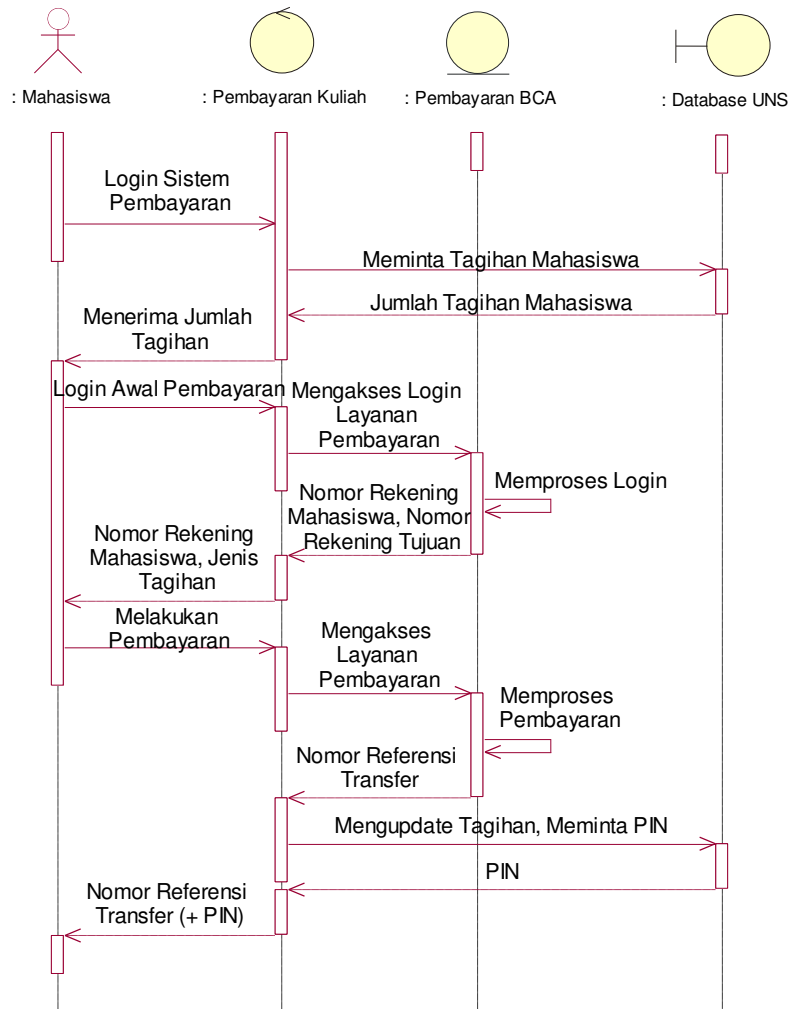
harus dikirim lewat faks ke UNS. Untuk mendapatkan PIN registrasi kuliah, mahasiswa harus mengkonfirmasi faks tersebut ke bagian pendidikan UNS.



Gambar 9 Diagram Aktivitas Aplikasi Pembayaran Mobile

Dengan aplikasi yang dibangun, mahasiswa tidak perlu mengantri di bank untuk pembayaran langsung ataupun mengurus bukti transfer untuk mendapatkan PIN pada pembayaran transfer. Mahasiswa cukup login ke dalam aplikasi kemudian memilih melakukan pembayaran, diikuti login internet banking, dilanjutkan dengan melakukan pembayaran melalui perangkat mobile mahasiswa. Bukti transfer dan PIN akan ditampilkan di perangkat mobile dan akan dikirimkan melalui SMS kepada mahasiswa.

Dari diagram aktivitas, maka didapatkan diagram sekuen seperti pada Gambar 10.



Gambar 10 Diagram Sekuen

Sebagai hasil implementasi dari desain tersebut, maka aplikasi-aplikasi di atas dapat diimplementasikan sebagai berikut. Implementasi WS BCA akan terdiri dari dua buah layanan yang diwujudkan ke dalam dua buah method yaitu `getUserData` dan `executeTransfer`. Method `getUserData` dipanggil saat client melakukan prosedur transfer langkah pertama (login IB-BCA) dan method `executeTransfer` dipanggil saat client melakukan prosedur transfer langkah kedua (melakukan transfer pembayaran). Method `getUserData` akan mengembalikan method `getUserData` dari kelas `UserBL` yang akan melakukan

pemeriksaan identitas client berdasarkan alamat IP, pemeriksaan identitas nasabah berdasarkan User Id IB-BCA dan hasil appli 1 Key BCA dan pengambilan nomor rekening nasabah dan nomor rekening client BCA. Method `executeTransfer` akan mengembalikan method `executeTransfer` dari kelas `PaymentBL` yang akan melakukan pemeriksaan identitas client berdasarkan alamat IP dan nomor rekening client, pemeriksaan identitas nasabah berdasarkan User Id IB-BCA, hasil appli 1 Key BCA dan nomor rekening nasabah, pengecekan jumlah saldo nasabah, proses transfer dari nomor rekening nasabah ke nomor rekening client, mengembalikan status transfer beserta pesan transfernya dan nomor referensi transfer.

Implementasi WS UNS dibangun berdasarkan kebutuhan sistem dan memiliki empat buah layanan yaitu yang diwujudkan dalam empat buah method. Method-method tersebut terdiri dari method `checkMobileBillingLogin`, method `checkIBankingLogin`, method `requestBill`, dan method `payBill`.

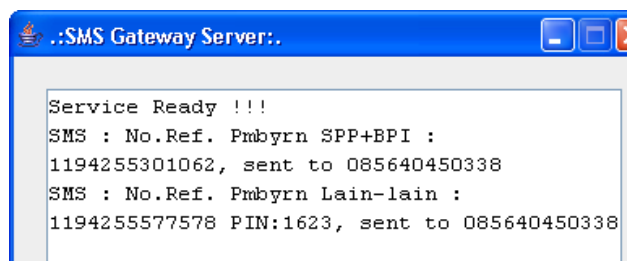
Method `checkMobileBillingLogin` ini melayani login aplikasi berdasar NIM dan password. Method ini akan mengembalikan method `checkMobileBillingLogin` dari kelas `UserBL` yang melakukan pemeriksaan aplikasi client berdasarkan alamat IP, pemeriksaan identitas mahasiswa berdasarkan NIM dan password aplikasi dan mengembalikan NIM, nama, password, nomor handphone tujuan pengiriman pesan notifikasi dan PIN melalui SMS.

Method `checkIBankingLogin` akan melayani login layanan pembayaran dari BCA dengan menggunakan User Id IB-BCA dan hasil appli 1 Key BCA. Method ini akan mengembalikan method `checkIBankingLogin` dari kelas `UserBL` yang akan melakukan pemeriksaan aplikasi client berdasarkan alamat IP, memanggil layanan transfer langkah pertama (method `getUserData`) dari WS BCA, menyesuaikan daftar nomor rekening UNS yang diterima dari hasil langkah kedua dengan daftar nomor rekening UNS yang digunakan untuk pembayaran masing-masing tipe tagihan kuliah mahasiswa dan mengembalikan nomor rekening mahasiswa dan nomor rekening UNS yang telah disesuaikan pada langkah ketiga.

Method `requestBill` digunakan untuk memperoleh data jumlah tagihan berdasarkan NIM. Method ini akan mengembalikan method `requestBill` dari kelas `BillBL` yang akan melakukan pemeriksaan aplikasi client berdasarkan alamat IP dan meminta tagihan berdasarkan NIM mahasiswa ke sistem akademik UNS.

Method payBill melayani transfer pembayaran dari mahasiswa ke UNS dengan melewati parameter NIM, tipe tagihan, jumlah pembayaran, nomor rekening mahasiswa, nomor rekening UNS, User Id IB-BCA mahasiswa dan hasil appli 1 Key BCA. Method ini akan mengembalikan method payBill dari kelas BillBL yang akan melakukan pemeriksaan aplikasi client berdasarkan alamat IP, memanggil layanan transfer langkah kedua (method executeTransfer) dari WS BCA, meng-update data tagihan mahasiswa di sistem akademik UNS, mengambil PIN dari sistem akademik UNS jika seluruh tagihan telah lunas dan mengembalikan nomor referensi transfer BCA, status transfer dan PIN jika seluruh tagihan telah lunas.

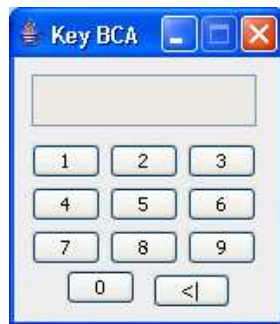
Implementasi Server SMS menggunakan RMI dan berbasis desktop serta memiliki layanan untuk mengirimkan SMS yang diwujudkan dalam sebuah method sendMessage yang menerima parameter masukan nomor handphone tujuan dan pesan yang ingin dikirim. Setelah aplikasi server SMS dijalankan, maka aplikasi akan dibuka pada alamat yang telah ditentukan.



Gambar 11 Tampilan Aplikasi Server SMS

Library SMS yang dibangun menggunakan AT Command untuk berinteraksi dengan modem GSM yang digunakan.

Sebagai simulasi dari Key BCA yang digunakan untuk autentikasi transfer nasabah BCA, maka dibuat sebuah aplikasi berbasis desktop untuk generate one time password. Generate password dilakukan dengan mengambil delapan digit terakhir waktu sekarang dalam milisecond dengan menggunakan method currentTimeMillis dari kelas System.



Gambar 12 Tampilan Awal Aplikasi Token Simulation

Sebagai aplikasi tatap muka, aplikasi client UNS dibangun berbasis web mobile dengan menggunakan framework Struts. Yang pertama kali ditampilkan adalah form login seperti yang tampak pada Gambar 13. Aksi login akan memanggil layanan WS UNS checkMobileBillingLogin dan jika login berhasil, jumlah dan jenis tagihan yang diambil dari layanan WS UNS requestBill akan ditampilkan kepada mahasiswa (Gambar 14). Jika login gagal akan muncul pesan kesalahan dan pengguna dapat login ulang.

Saat mahasiswa memilih untuk membayar tagihan kuliahnya, maka form login IB-BCA akan dimunculkan (Gambar 15). Mahasiswa harus memasukkan User Id IB-BCA dan hasil appli 1 dari Key BCA. Saat login IB-BCA, layanan checkIBankingLogin dari WS UNS akan dipanggil dan form pembayaran tagihan akan dimunculkan begitu login berhasil seperti yang terlihat pada Gambar 16.



Gambar 13 Tampilan Awal Aplikasi UNSMobileBilling

...Sistem Tagihan Mobile UNS...

Sistem Tagihan Mobile UNS -
BCA

050004074 / DHINI ROSSALINA
AGUSTA

Tagihan Anda semester ini adalah
sebagai berikut :

Jns	Jml	Dibayar
Tagihan	Tagihan	
SPP+BPI	510000	0
Lain-lain	32500	0

[Lakukan Pembayaran Tagihan](#)
[Kuliah](#)
[Logout](#)

Options Back

Gambar 14 Tampilan Tagihan Aplikasi UNSMobileBilling

...Sistem Tagihan Mobile UNS...

Sistem Tagihan Mobile UNS -
BCA

050004074 / DHINI ROSSALINA
AGUSTA

Silakan masukkan User ID
IBanking BCA dan Hasil Appli 1
Token BCA Anda

User ID

dhinirossa2211

Hasil Appli 1 Token

64158718

Login

[Kembali ke Menu Utama](#)
[Logout](#)

Options Back

Gambar 15 Tampilan Login IB-BCA Aplikasi UNSMobileBilling

..:Sistem Tagihan Mobile UNS:..

Silakan Pilih Jenis Tagihan yang Akan Dibayar, Nomor Rekening yang Akan Digunakan untuk Membayar dan Hasil Appli 1 Token BCA Anda

Jenis Tagihan

SPP+BPI

Nomor Rekening

03444255723

Hasil Appli 1 Token

55209281

Transfer

Options Back

Gambar 16 Tampilan Pembayaran Aplikasi UNSMobileBilling

..:Sistem Tagihan Mobile UNS:..

Akan Dibayar, Nomor Rekening yang Akan Digunakan untuk Membayar dan Hasil Appli 1 Token BCA Anda

* Transfer ke nomor rekening 25223510392 atas nama UNS B1 sukses. Simpan baik - baik PIN dan Nomor Referensi Transfer berikut ini.

* PIN dan Nomor Referensi Transfer telah dikirim ke Nomor Mobile 085640450338.

PIN Anda : 1623

Nomor Referensi Transaksi Anda : 1194255577578

[Kembali ke Menu Utama](#)

[Logout](#)

Options Back

Gambar 17 Tampilan Pembayaran Telah Lunas Pada Aplikasi UNS Mobile

Eksekusi pembayaran akan memanggil layanan payBill dari WS UNS dengan memasukkan parameter NIM, jenis tagihan, jumlah tagihan, nomor rekening sumber, nomor rekening tujuan, User Id IB-BCA mahasiswa dan hasil appli 1 Key BCA. Jika pembayaran tagihan berhasil, layanan SMS akan dipanggil untuk mengirimkan pesan kepada mahasiswa. Pada aplikasi pembayaran, jika seluruh pembayaran telah dilunasi maka akan tampil seperti pada Gambar 17.

Pada tahapan pengujian, sistem yang telah jadi diuji dengan pengujian menggunakan user tunggal dan multiuser. Pengujian dilakukan dengan

menggunakan simulator mobile web browser Nokia versi 4.0. Pada pengujian user tunggal, aplikasi web mobile client dapat berjalan dengan baik. Yang menjadi kendala adalah handphone yang digunakan untuk modem GSM. Setiap jenis handphone memiliki perbedaan dukungan sebagai modem GSM. Contohnya adalah Ben-Q Siemens E61 dan Motorola E398. Pengiriman pesan beruntun menggunakan Ben-Q Siemens E61 sering gagal. Setiap pengiriman pesan kelipatan genap selalu gagal. Hal ini berbeda dengan setelah layanan pengiriman pesan diperbaiki dengan cara pengulangan pengiriman seperti yang telah disebutkan di atas. Pada awalnya setelah user membayar tagihan pertama kemudian melakukan pelunasan, pesan pelunasan SMS selalu gagal.

Pada pengujian multiuser, aplikasi web mobile client dijalankan oleh enam user berbeda dengan menggunakan enam simulator handphone. Dengan menggunakan Ben-Q Siemens sebagai modem GSM, sebelum layanan aplikasi ditangani dengan pengulangan pesan, pengiriman pesan pembayaran baik pelunasan maupun bukan, pesan pembayaran tidak selalu berhasil. Dari enam user yang melakukan pembayaran, tiga user menerima pesan SMS pembayaran, tiga user tidak menerima pesan SMS pembayaran. Namun setelah ditangani dengan pengulangan pesan, maka keenam user berhasil menerima pesan SMS pembayaran. Dengan menggunakan Motorola E398, pengiriman pesan pembayaran berhasil dengan sempurna.

5. Kesimpulan

Dalam perancangan sistem pembayaran uang kuliah berbasis mobile yang mengimplementasikan teknologi Web Service, Struts, RMI dan SMS ini, dapat ditarik beberapa kesimpulan. Sistem yang dibangun dapat mengintegrasikan aplikasi berbeda platform dengan menggunakan Web Service dan RMI. Dengan menggunakan Web Service, aplikasi client tidak tergantung dengan bahasa pemrograman tertentu dan platform tertentu. Aplikasi web mobile client yang berjalan pada perangkat mobile walaupun dibangun dengan bahasa yang sama, dapat dibangun kembali dengan menggunakan bahasa yang lain dan tetap berjalan biasa. Dengan menggunakan RMI, aplikasi berbasis web dapat berkomunikasi dengan aplikasi desktop, hal ini ditunjukkan pada saat aplikasi client web mobile yang berbasis web memanggil aplikasi server SMS yang berbasis desktop untuk mengirim SMS. Desain dan pengembangan aplikasi client web mobile pembayaran UNS dengan konsep MVC dengan menggunakan framework Struts dapat berjalan pada perangkat mobile sehingga pengembangan aplikasi web mobile yang lain dengan konsep MVC dan

framework Struts dapat dilakukan. Penggunaan aplikasi ini akan mempercepat mahasiswa dalam pembayaran uang kuliah karena dengan aplikasi ini mahasiswa tidak perlu menunggu untuk antri pembayaran di bank atau harus mengurus PIN jika melalui pembayaran transfer. Penggunaan handphone sebagai modem GSM sangat perlu diperhatikan karena setiap handphone memiliki dukungan pengiriman SMS yang berbeda. Sebagai contoh adalah Ben-Q Siemens E61 dan Motorola E398. Jika menggunakan Ben-Q Siemens E61, pengiriman pesan secara beruntun selalu gagal pada pengiriman pesan kedua, namun dengan menggunakan Motorola E398, pengiriman pesan beruntun tidaklah menjadi masalah. Jika diimplementasikan secara nyata, sistem ini sangat bergantung pada koneksi jaringan karena melibatkan aplikasi-aplikasi server yang terpisah. Semakin baik konektivitas jaringan yang digunakan, semakin cepat layanan ini diakses.

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Membangun Prototipe Pembelajaran Studi Data Warehouse Dengan Sampel Explore Sistem di Jurusan Teknik Informatika Universitas Dr. Soetomo Surabaya

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Abstract

The Prototype of learning data warehouse is used by data warehouse course. The prototype is interactive media software to learn data warehouse concept and to learn how build a data warehouse.

The example of enterprise is University System. Because Students are familiar with University System. For first system is Academic System that be explored on Informatic Department of Dr. Soetomo University.

The prototype is classified on two. First part is learning about concept of data warehouse. Second part is learning about how to build data warehouse.

Keywords: *Prototype, Interactive media software, Concept Data Warehouse, Build data warehouse*

1. Pendahuluan

Untuk membangun suatu sistem terkomputerisasi, tidak hanya diperlukan kemampuan untuk memahami sistem riil saja. Tetapi seseorang harus mengerti juga mengenai teknologi informasi, khususnya mengenai perangkat keras dan perangkat lunak komputer.

Seperti diketahui, pada saat ini ada beragam jenis perangkat keras dan perangkat lunak komputer yang telah diciptakan. Dimana masing-masing jenis menawarkan berbagai keunggulan dan kelebihan masing-masing. Sehingga pada akhirnya sering kita jumpai antar enterprise satu dengan yang lainnya pasti memiliki sistem terkomputerisasi dengan teknologi informasi yang berbeda. Bahkan terkadang dijumpai pula satu enterprise yang memiliki

banyak departemen terdapat beberapa sistem terkomputerisasi dengan teknologi informasi yang berbeda pula.

Apa yang harus dilakukan selanjutnya jika pihak eksekutif dari enterprise ingin memadukan seluruh informasi yang ada. Caranya adalah dengan membangun suatu data warehouse yang dapat mengorganisir seluruh sistem yang ada.

Konsep data warehouse menjadi sangat terkenal dan banyak dipakai sekitar awal tahun 2003. Sehingga materi ini dimasukkan ke kurikulum berbasis kompetensi jurusan Teknik Informatika Universitas Dr. Soetomo Surabaya.

Dengan adanya prototipe pembelajaran studi data warehouse, Mahasiswa akan mampu melakukan organisasi data dari sumber sistem yang berbeda. Mahasiswa benar-benar difokuskan untuk mengerti bagaimana cara membangun suatu sistem warehouse yang sesungguhnya

2. Membangun Prototipe Pembelajaran Data Warehouse

Materi perkuliahan data warehouse memerlukan pengkajian yang total baik secara konsep maupun implementasi. Untuk itu dalam prototipe pembelajaran yang akan dibangun akan dibagi menjadi 2, bagian pertama akan mempelajari konsep mengenai data warehouse. Bagian kedua akan mempelajari mengenai bagaimana membangun data warehouse. Pada gambar 1 ditunjukkan desain kerangka prototipe studi pembelajaran data warehouse yang akan dibangun.



Gambar 1. Desain Kerangka Prototipe Studi Pembelajaran DW

3. Prototipe Desain Data Warehouse

Perancangan Data Warehouse

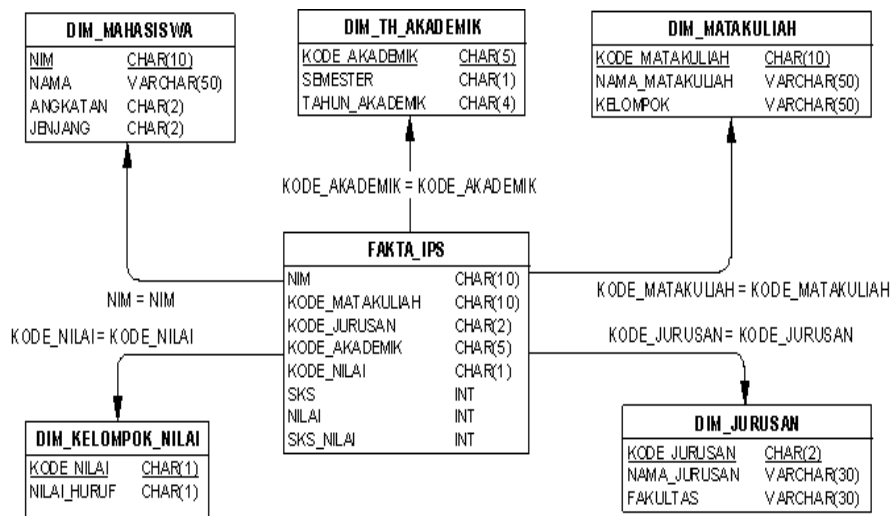
Pada tahap mempelajari desain data warehouse, didalam prototipe pembelajaran akan diberi contoh bagaimana melakukan perancangan konseptual atau logical Data Warehouse, perancangan Fisik Data Warehouse.

Perancangan Konseptual (Logical) Data Warehouse

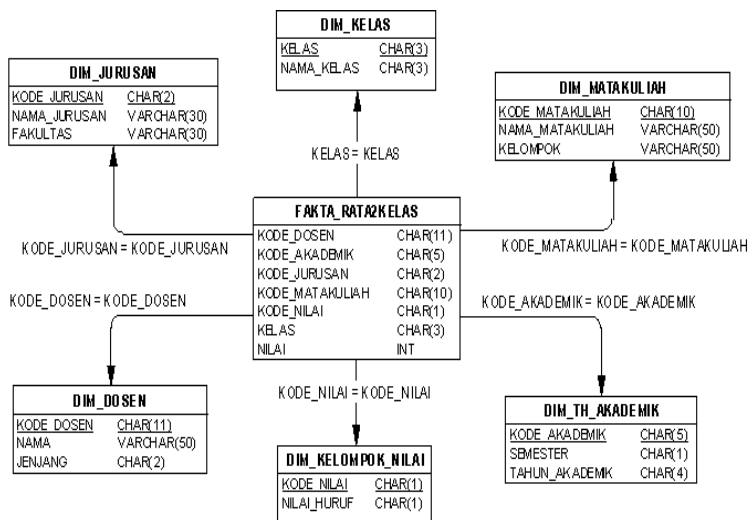
Untuk contoh analisis yang akan dipakai pada prototipe pembelajaran data warehouse, diberi contoh 3 analisis. Pada penelitian ini difokuskan pada tiga informasi utama untuk mendukung analisis tersebut, yaitu Informasi IPS (Indeks Prestasi Sementara) untuk menganalisis prestasi yang telah dicapai oleh mahasiswa UNITOMO, Informasi Rata-rata Kelas untuk menganalisis nilai rata-rata setiap kelas yang dicapai oleh setiap dosen, dan Informasi Kehadiran Dosen untuk menganalisis jumlah kehadiran dosen. Informasi Rata-rata Kelas dan Informasi Kehadiran Dosen sebagai bahan analisis terhadap kinerja yang telah dicapai oleh dosen. Semua informasi yang digunakan untuk keperluan proses analisis atas kinerja proses belajar mengajar di UNITOMO disimpan dalam sistem data warehouse yang selanjutnya diakses oleh OLAP untuk menampilkan analisis yang diperlukan tersebut.

Desain suatu sistem data warehouse dimulai dengan pembuatan skema tabel-tabel yang dipergunakan oleh OLAP untuk membuat struktur informasi multidimensi yang sesuai dengan kebutuhan UNITOMO. Berdasarkan penelitian yang dilakukan, maka model pendekatan yang cocok adalah model Star Schema.

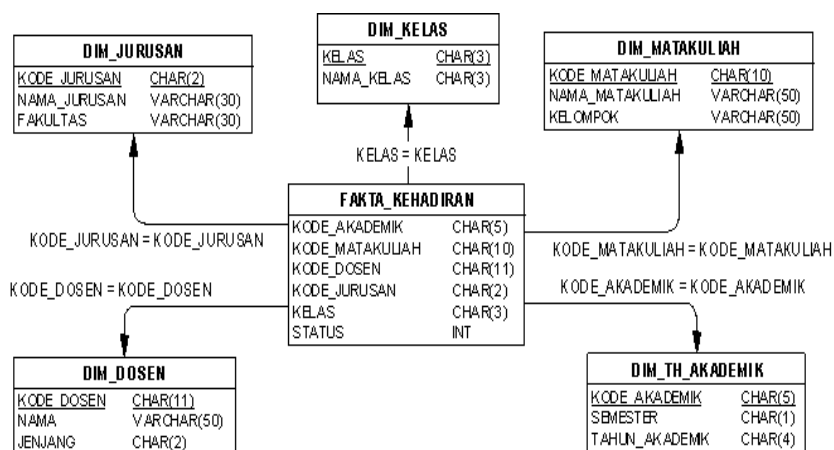
Berdasarkan uraian di atas, maka sistem data warehouse dengan menerapkan metode OLAP yang akan dibangun pada UNITOMO memerlukan 3 buah Star Schema, yaitu informasi IPS, informasi Rata-rata Kelas dan informasi Kehadiran Dosen. Adapun perancangan untuk ketiga star schema yang akan diimplementasikan pada UNITOMO tersebut, seperti ditunjukkan pada gambar 2, 3, dan 4.



Gambar 2. Star Schema Informasi IPS Mahasiswa



Gambar 3. Star Schema Informasi Rata-rata Kelas



Gambar 4. Star Schema Informasi Kehadiran Dosen

Perancangan Fisik Data Warehouse

Berdasarkan perancangan konseptual atau logical dari Star Schema Informasi IPK Mahasiswa (Gambar 2), Star Schema Informasi Rata-rata Kelas (Gambar 3 dan Star Schema Informasi Kehadiran (Gambar 4) maka dapat dibuat perancangan fisik data warehouse.

Perancangan Proses ETL

Proses ETL (Extracting, Transforming and Loading) adalah proses pemindahan informasi dari database OLTP (On Line Transaction Processing) ke dalam database data warehouse. Ada 3 proses utama dalam proses ETL, yaitu :

1. Proses Ekstraksi
2. Proses Transformasi
3. Proses Pemuatan (Loading)

Detail dari ketiga proses tersebut akan dijelaskan pada sebagai berikut:

Proses Ekstraksi.

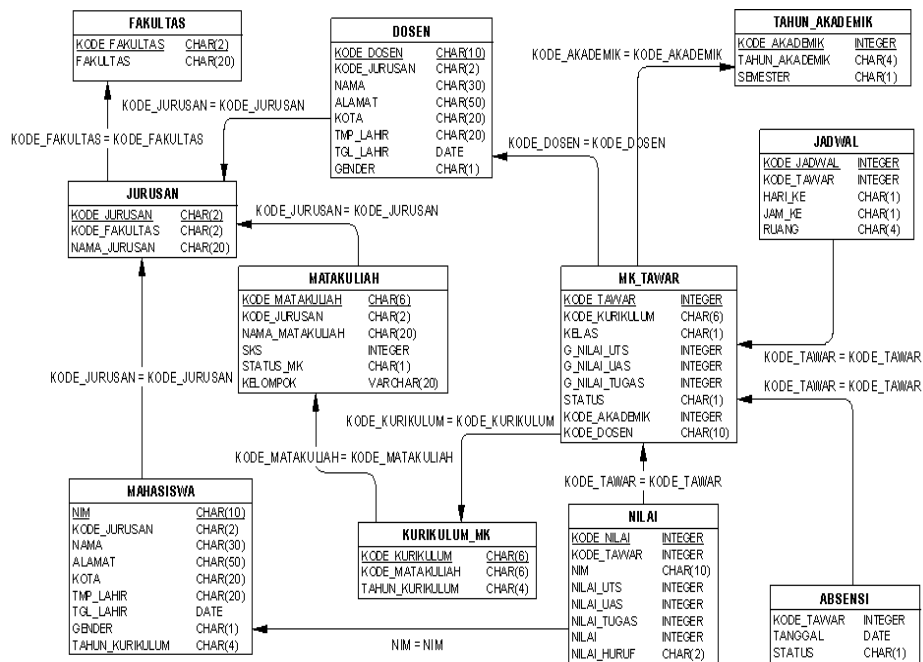
Proses ekstraksi adalah proses pemilihan atribut-atribut data yang digunakan dalam data warehouse. Penentuan suatu atribut data yang akan dipakai dalam

data warehouse disesuaikan dengan perancangan star schema warehouse dengan mempertimbangkan skema relasi dari database transaksi, OLTP.

Pada prototipe pembelajaran ini contoh database OLTP yang akan dipakai seperti ditunjukkan pada gambar 5.

Proses Transformasi

Proses transformasi adalah proses pemindahan data dari tabel asal ke tabel tujuan. Perancangan proses transformasi pada penelitian ini ada tiga tahap proses yaitu : Proses transformasi dari database OLTP ke file teks, proses tranformasi dari file teks ke tabel sementara (staging tabel) dan yang terakhir adalah proses transformasi dari tabel sementara ke data warehouse



Gambar 5. Skema Relasi Akademik UNITOMO

Proses Transformasi OLTP ke File Teks

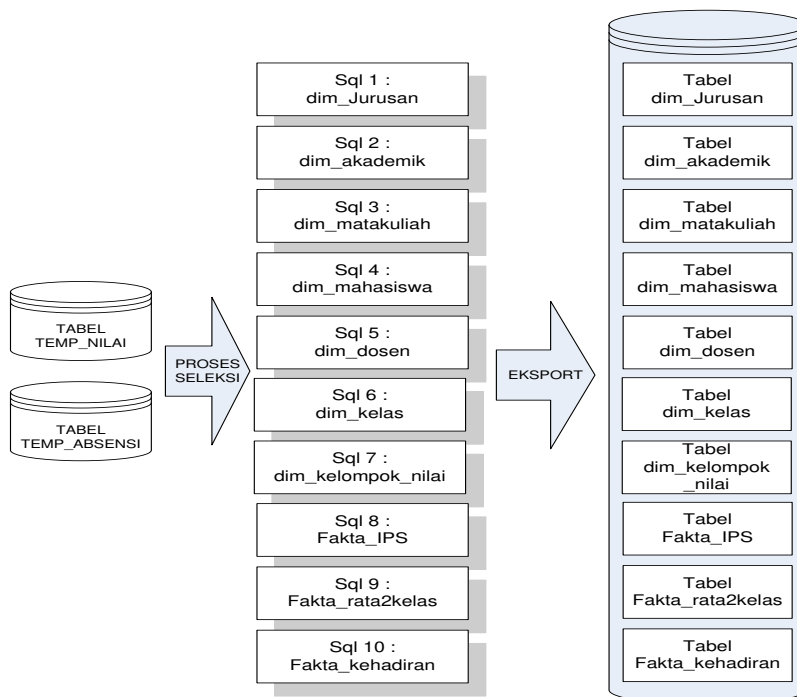
Pada bagian sebelumnya telah disebutkan bahwa database sumber yang berbentuk DBF yang berada pada server yang terpisah dengan database tujuan

(warehouse) serta dengan platform yang berbeda, maka transformasi dari database sumber ke file teks dan dari file teks ke database tujuan lebih mudah dilaksanakan daripada transformasi langsung dari sumber ke tujuan.

Proses Transformasi File Teks ke Tabel Sementara (Staging Table)

Proses transformasi berikutnya yaitu file teks yang dihasilkan dari transformasi sebelumnya diekspor ke tabel sementara (staging table). Fungsi dari tabel sementara ini adalah sebagai wadah dilakukan cleansing (perbaikan data) yang tidak konsisten. Pengertian konsisten di sini adalah melakukan standarisasi dengan format yang sama dan memfilter informasi yang tidak lengkap (misalnya satu atau lebih kolomnya null / tidak ada isi).

Sebelum dilakukan proses ekspor, dibuat dua buah tabel yang akan menjadi tempat penampungan kedua file teks tersebut. Untuk lebih jelasnya dilihat di gambar 6.



Gambar 6. Proses ekspor file teks ke tabel sementara (staging table)

Proses Transformasi Tabel Sementara ke Data Warehouse.

Proses transformasi terakhir adalah dari tabel sementara (tabel temp_nilai dan tabel temp_absensi) ke database warehouse.

Proses Pemuatan (Loading)

Proses Pemuatan (loading) adalah proses terakhir dari ETL, yaitu mengambil informasi yang ada di dalam data warehouse ke aplikasi antar muka OLAP. Beberapa contoh software yang bisa melihat isi dari data warehouse seperti Excel, Crytal Managers, Business Intellegence Development Studio SQL Server 2005.

Perancangan Kubus Multidimensi

Pada tahap desain kubus multidimensi ini dirumuskan kubus yang mempunyai dimensi-dimensi berdasarkan kebutuhan pihak UNITOMO atas laporan analisis prestasi akademik, yaitu bagaimana data atau hasil perhitungan dilihat dalam bentuk detail (drill down) dan ringkasannya (drill up) serta baris atau kolom yang dibuka atau ditutup (slice/dice).

Adapun kubus multidimensi yang akan dibuat disesuaikan dengan jumlah tabel fakta yang dilibatkan. Pada penelitian ini dirancang 3 buah kubus yaitu Analisis_IPS.cube, Analisis_Rata2Kelas. Cube dan Analisis_Kehadiran yang menggunakan dimensi yang diambil dari tabel dimensi yang telah dirancang pada tahap perancangan data warehouse.

Perhitungan IPS yang dilakukan bisa menggunakan Calculated Member atau fasilitas Calculation atau fasilitas KPI dari On-Line Analytical Processing.

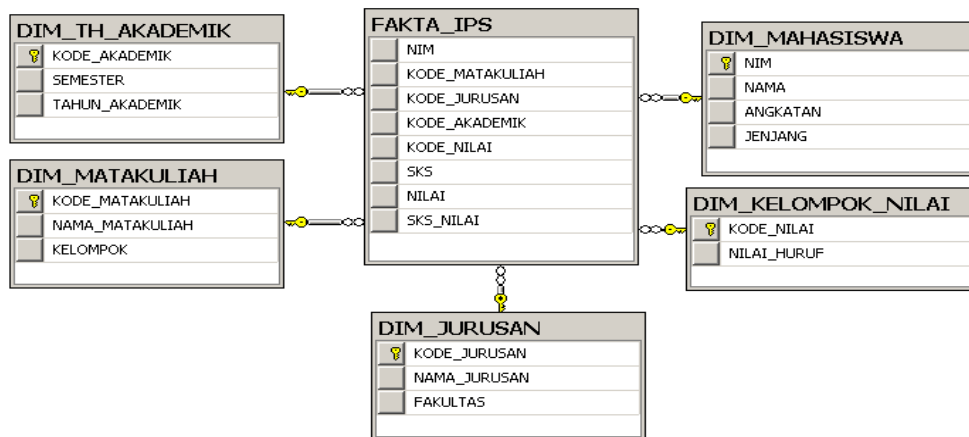
4. Prototipe Implementasi Data Warehouse

Implementasi Skema Fisik Data Warehouse

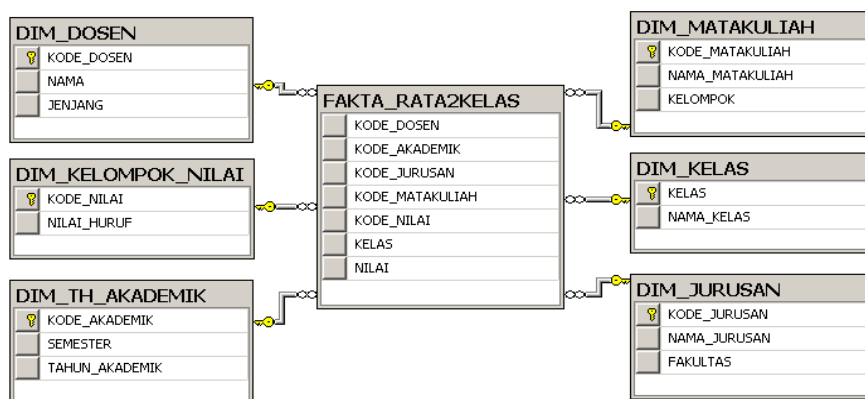
Rancangan yang telah dibuat sebelumnya, diimplementasikan dengan

pembuatan fisik data warehouse yang bernama **DW Akademik Unitomo** di database server yaitu Microsoft SQL Server 2005.

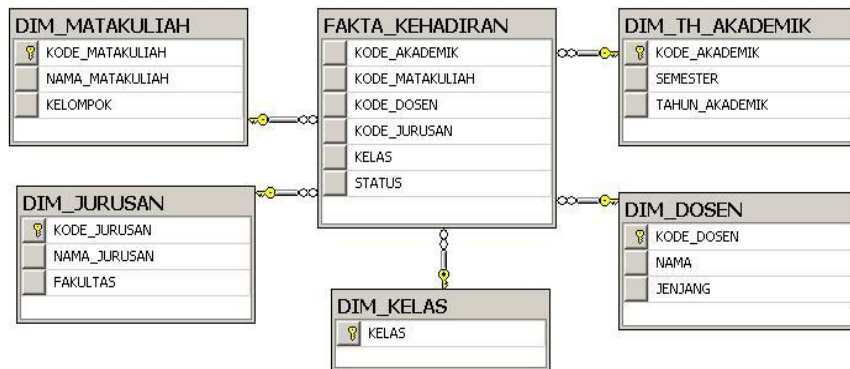
Implementasi skema fisik data warehouse UNITOMO ini dihasilkan 7 tabel dimensi dan 3 tabel fakta yaitu : tabel DIM_DOSEN, tabel DIM_MAHASISWA, tabel DIM_MATAKULIAH, tabel DIM_TH_AKADEMIK, tabel DIM_JURUSAN, tabel DIM_KELAS, tabel DIM_KELOMPOK_NILAI, tabel FAKTA_IPS, tabel FAKTA_RATA2KELAS dan tabel FAKTA_KEHADIRAN (Gambar 7, 8 dan 9).



Gambar 7. Implementasi Skema fisik Informasi IPS



Gambar 8. Implementasi Skema fisik Informasi RATA2 KELAS



Gambar 9. Implementasi Skema fisik Informasi KEHADIRAN

Implementasi Proses ETL

Proses Extracting, Transforming and Loading pada tahap implementasi ini menggunakan fasilitas DTS (Data Transformation System) Microsoft SQL Server 2005 .

Implementasi Proses Ekstraksi

Implementasi proses ekstraksi dari kolom-kolom pada database OLTP Akademik UNITOMO dengan menggunakan skrip query dan selanjutnya menggunakan proses transformasi data pada fasilitas DTS di ekspor ke file teks dengan format pemisah antar kolom memakai titik-koma (;). File-file yang dihasilkan NILAI.txt untuk menyimpan nilai-nilai mahasiswa beserta dosen pengajarnya, dan KEHADIRAN.txt yang berisi daftar kehadiran dosen mengajar.

Implementasi Proses Transformasi File Teks ke Tabel Sementara

Pada proses ini, file teks ditransformasikan ke database sementara 'STAGING DW UNITOMO' yang terdiri dari dua tabel yakni tabel NILAI_TEMP

dan KEHADIRAN_TEMP.

Implementasi Proses Transformasi Tabel Sementara ke Tabel Warehouse

Proses selanjutnya yaitu transformasi dari tabel sementara yang ada di database STAGING DW UNITOMO ke database warehouse DW AKADEMIK UNITOMO

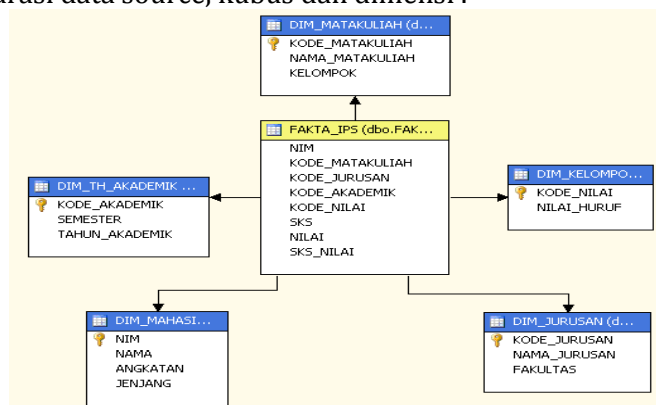
5. Prototipe Implementasi On-Line Analytical Processing (OLAP)

Pada tahap implementasi On-Line Analytical Processing (OLAP) ini diawali dengan implementasi kubus multidimensi, implementasi konfigurasi penyimpanan dan diakhiri dengan implementasi keamanan.

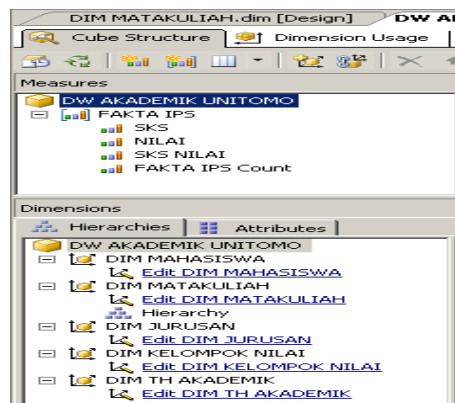
Implementasi Kubus Multidimensi Microsoft SQL Server Analysis.

Pembuatan kubus multidimensi menggunakan Microsoft SQL Server Analysis Services 2005. Ada beberapa tahapan pada implementasi kubus multidimensi :

1. Deklarasi data source, kubus dan dimensi .

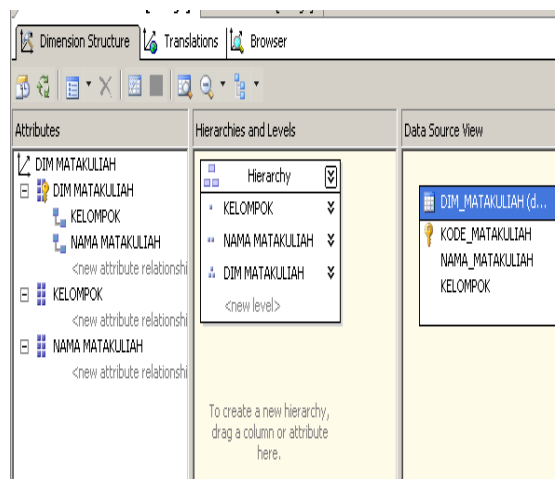


Gambar 10. Data source view analisis IPS mahasiswa.



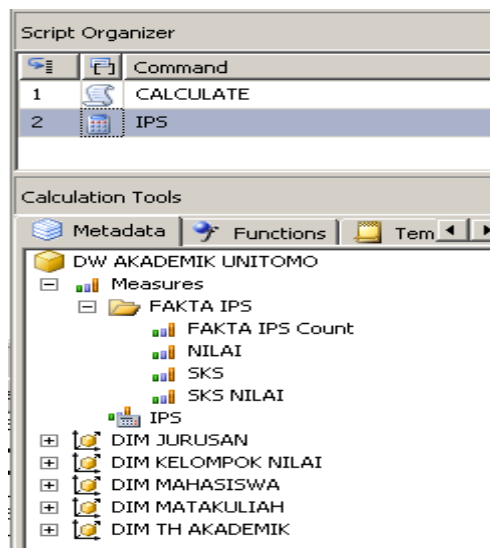
Gambar 11. Kubus dan Dimensi Analisis IPS mahasiswa.

2. Deklarasi Hierarki



Gambar 12. Deklarasi hierarki dimensi matakuliah

3. Deklarasi Measure

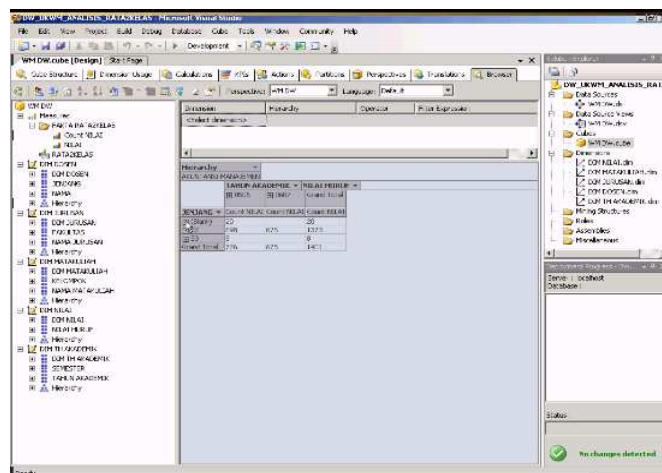


Gambar 13. Deklarasi measure IPS mahasiswa

6. Prototipe Desain Media Pembelajaran

Desain Prototipe Pembelajaran Studi Data Warehouse

Kerangka prototipe pembelajaran studi data warehouse dirancang berdasarkan pada gambar 1. Selain itu dibuat pula demo untuk pembelajaran implementasi membangun data warehouse. Sehingga media pembelajaran yang akan dibangun benar-benar informatif. Untuk itu perlu dibangun movie dari setiap tahapan dalam membangun data warehouse. Contoh potongan untuk masing-masing pembelajaran seperti ditunjukkan pada gambar 14.



Gambar 14: Potongan Movie Pembelajaran DTS File Text ke Staging File

7. Kesimpulan

Prototipe studi pembelajaran data warehouse sangat membantu Mahasiswa dalam memahami teori Data Warehouse dan membangun model data warehouse. Prototipe dengan sampel explore sistem akademik di Jurusan Teknik Informatika sangat mudah dipahami karena secara tidak langsung Mahasiswa berada pada lingkup sistem tersebut.

Pada prototipe ini, Mahasiswa dapat mengenal tahapan pembuatan Data Warehouse, yang meliputi:

- Konsep Data warehouse
- Desain Star Schema
- Proses ETL
- Penggunaan OLAP untuk analisa Sistem

Daftar Pustaka

CRYSTAL DECISIONS, INC (2001) Crystal Analysis Professional User's Guide,
Crystal Decisions

FORSMAN, SARAH (1997) OLAP Council White Paper, OLAP Council

- LEVINE E. (2002) Building a Data Warehouse. **American School Board Journal**, November, Hal 1-6
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- THOMSEN, ERIK (1997) Olap Solution: Building Multidimensional Information System, Jhon Wiley & Sons, Inc
- WIERSCHEM D., JEREMY M., RANDY M.B. (2003) Methodology for developing an academic data warehouse. **Texas A&M University-commerce**

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Mengacu pada format American Psychological Association (APA)

1. Buku

a. Buku tanpa Bab

Referensi pada tulisan

... which offered a theoretical backdrop for a number of innovative behavior modification approaches (Skinner, 1969).

Referensi pada akhir tulisan (daftar pustaka)

Skinner, B.F. (1969). *Contingencies of reinforcement*. New York: Appleton-Century-Crofts.

Bremner, G., & Fogel, A. (Eds.). (2001). *Blackwell handbook of infant development*. Malden, MA: Blackwell.

b. Buku dengan Bab

Referensi pada tulisan

... The elucidation of the potency of infant-mother relationships, showing how later adaptations echo the quality of early interpersonal experiences (Harlow, 1958, chap. 8).

Referensi pada akhir tulisan (daftar pustaka)

Harlow, H. F. (1958). Biological and biochemical basis of behavior. In D. C. Spencer (Ed.), *Symposium on interdisciplinary research* (pp. 239-252). Madison: University of Wisconsin Press.

c. Buku tanpa penulis

Referensi pada tulisan

... the number of recent graduates from art schools in France has shown that this is a trend worldwide (Art Students International, 1988).

Referensi pada akhir tulisan (daftar pustaka)

Art students international. (1988). Princeton, NJ: Educational Publications International.

d. Buku dengan edisi / versi

Strunk, W., Jr., & White, E. B. (1979). *The elements of style* (3rd ed.). New York: Macmillan.

Cohen, J. (1977). *Manual labor and dream analysis* (Rev. ed.). New York: Paradise Press.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th Ed.). Washington, DC: Author.

e. Buku terjemahan

Luria, A. R. (1969). *The mind of a mnemonist* (L. Solotaroff, Trans.). New York: Avon Books. (Original work published 1965)

f. Buku dengan beberapa volume

Referensi pada tulisan

... The cognitive development of the characters in Karlin's class illustrates the validity of this new method of testing (Wilson & Fraser, 1988-1990).

Referensi pada akhir tulisan (daftar pustaka)

Wilson, J. G., & Fraser, F. (Eds.). (1988-1990). *Handbook of wizards* (Vols. 1-4). New York: Plenum Press.

2. Jurnal

a. Artikel Jurnal

Referensi pada tulisan

When quoting an author's words exactly, indicate the page number:
Even some psychologists have expressed the fear that "psychology is in danger of losing its status as an independent body of knowledge" (Peele, 1981, p. 807).

Referensi pada akhir tulisan (daftar pustaka)

Peele, S. (1981). Reductionism in the psychology of the eighties: Can biochemistry eliminate addiction, mental illness, and pain? *American Psychologist*, 36, 807-818.

b. Artikel Jurnal, lebih dari enam pengarang

Referensi pada tulisan

... the nutritional value of figs is greatly enhanced by combining them with the others (Cates et al., 1991).

Referensi pada akhir tulisan (daftar pustaka)

Cates, A. R., Harris, D. L., Boswell, W., Jameson, W. L., Yee, C., Peters, A. V., et al. (1991). Figs and dates and their benefits. *Food Studies Quarterly*, 11, 482-489.

3. Sumber Digital

a. Buku elektronik dari perpustakaan digital

Wharton, E. (1996). *The age of innocence*. Charlottesville, VA: University of Virginia Library. Retrieved March 6, 2001, from netLibrary database.

b. Artikel Jurnal dari perpustakaan digital

Schraw, G., & Graham, T. (1997). Helping gifted students develop metacognitive awareness. *Roeper Review*, 20, 4-8. Retrieved November 4, 1998, from Expanded Academic ASAP database.

c. Artikel Majalah atau Koran dari Internet (bukan dari perpustakaan digital)

Sarewitz, D., & Pielke, R. (2000, July). Breaking the global warming gridlock [Electronic version]. *The Atlantic Monthly*, 286(1), 54-64.

d. Artikel e-Journal

Bilton, P. (2000, January). Another island, another story: A source for Shakespeare's *The Tempest*. *Renaissance Forum*, 5(1). Retrieved August 28, 2001, from <http://www.hull.ac.uk/renforum/current.htm>

e. Halaman Web

Shackelford, W. (2000). The six stages of cultural competence. In *Diversity central: Learning*. Retrieved April 16, 2000, from http://www.diversityhotwire.com/learning/cultural_insights.html

f. Web Site dari organisasi

American Psychological Association. (n.d.) *APAStyle.org: Electronic references*. Retrieved August 31, 2001, from <http://www.apa.org/journals/webref.html>

4. Sumber Lain

a. Artikel Koran, tanpa pengarang

Counseling foreign students. (1982, April). *Boston Globe*, p. B14.

b. Tesis

Caravaggio, Q. T. (1992). *Trance and clay therapy*. Unpublished master's thesis, Lesley University, Cambridge, MA.

c. Desertasi

Arbor, C.F. (1995). *Early intervention strategies for adolescents*. Unpublished doctoral dissertation, University of Massachusetts at Amherst.

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